



FRIDAY, MAY 12, 1876.

# Contributions.

## An Austrian Engineer on American Bridges.

Engineering Office of Walton W. Evans,  
No. 63 PINE STREET, NEW YORK, May 5, 1876.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Some time since Mr. Ernest Pontzen, an eminent Austrian engineer, sent me a copy of a paper on bridges which he had written and read before the Austrian Society of Engineers at Vienna. In 1874 Mr. Pontzen, accompanied by Mr. Lauber, was sent to this country to examine and report on the public works of the United States. They became while here very much interested in the American system and designs for building bridges of iron, and not only obtained all the information they could at the time, but, like Oliver Twist, have been "asking for more." This has resulted in Mr. Pontzen's writing the above-named paper, which is more properly called, "A Comparison of Certain Bridges of Europe with the Verrugas Viaduct," a structure built under my direction by the Baltimore Bridge Company for the Oroya Railway in Peru.

As the paper was in German, I had it translated; and I find it contains much valuable bridge data and a well written and strongly expressed opinion by Mr. Pontzen in favor of the American designs and system of building bridges of iron. I have been asked by several engineers and by the Secretary of the American Society of Civil Engineers to send this paper to you for publication, as it contains much matter that is of great interest to American engineers and bridge-builders, and particularly so as it comes from a source strictly unprejudiced, and from an engineer who was brought up and fed mentally on the merits of the riveted system of bridge-building. I now send you the paper, and beg that you will find room for it in your valuable journal.

Another German engineer, who is a convert in part to our system for bridges (he would have been converted in whole if he had remained here a little longer), is now writing an elaborate paper (to come out in the *Hanover Journal*) on American bridges, and will advocate some of our ideas; but he writes me that these ideas are considered rank heresy in Berlin. The time will come when they will pin their faith on our pin-connected rather than on riveted-connected bridges.

As some of the European engineers, and particularly the English engineers, have cried out so loudly against the pin-connected system, and asserted that in time the pins would wear out through vibrations occasioned by passing trains, I sent to Chile, and have now got some of the pins which were recently taken from the Maipo Bridge, a structure of thirteen spans, built under my directions, and finished over eighteen years since. They do not show the slightest sign of wear, nor have they been injured by oxidation, yet they were not made to fit so nicely and closely as all bridge pins now are. They had at least 1-16 of an inch play in the holes, while the finished pins used now fit to within 1-64 of an inch.

W. W. EVANS.

## THE VERRUGAS VIADUCT COMPARED WITH SEVERAL OTHER VIADUCTS.

BY ERNEST PONTZEN, C. E.

(Translated from the *Journal of the Austrian Society of Engineers and Architects*, No. 14, 1875.)

At a distance of about 11 miles from Lima (Peru), the Oroya Railroad crosses the valley of the "Agua de Verrugas" at a height of 1,670 metres (5,478 ft.) above the level of the sea, by means of the viaduct which was finished at the beginning of the year 1873.

This viaduct, which rests upon iron columns, is not remarkable on account of the length of its four bridge spans, but for the height of its three iron piers, the rapidity and cheapness of its construction, and also for its elegance, which is illustrated by the accompanying cut.

This structure has already been briefly discussed by several professional journals, and also in the *Journal of the Austrian Society of Civil Engineers and Architects*, XXVI., Annual Series (the Railroad in South America over the Andes). The more specific data I owe to the kindness of Mr. Walton W. Evans, of New York, who, in his capacity as consulting engineer for a number of South American railroads, was also connected with the construction of this viaduct, as designated by the engineer, Charles Latrobe.

A comparison with several similar viaducts, i. e., such as exist in Europe, also sustained by iron piers, furnishes a good basis for judging the Verrugas Viaduct. I will here enumerate their characteristic data, as far as I know them; the mere comparison of those data with those referring to the Verrugas Viaduct will command for the latter the attention it merits.

The Crumlin Viaduct is about a mile from Pontypool, on the Newport, Abergavenny & Hereford Railroad; it was begun in December of 1853, and was opened to traffic after about 3½ years, namely, on June 1, 1857. It is built for two tracks, and its ten bridge panels, all of which have equal spans, rest upon cast-iron columns, which are placed 45.75 m. (150 ft.) apart from centre to centre. Between the third and fourth panels only a branch of a chain of mountains is employed to assist in sustaining the ends of the bridge girders, thus reducing to eight the number of columns necessary.

The railroad track on this viaduct is about 60 m. (197 ft.) above the bottom of the valley, and the maximum height of the pillars is 53 m. (174 ft.)

The total amount of material used was about 1,325 tons of wrought iron, 1,275 tons of cast iron, 600 cubic metres (785 cubic yards) masonry, and 70 cubic metres (92 cubic yards) of wood.

The viaducts over the Thur and over the Glatt, which were built in Switzerland, near Wyl and Flawyl, in the years 1855 and 1856, have single tracks and rest on cast-iron columns.

The former of these has two clear spans of 28.8 m. (94 ft. 6 in.) each, and two of 36.6 m. (120 ft.) each, while the total weight of its three iron piers, each 14.67 m. (48 ft. 1½ in.) high, is

208,948 kilograms (459,686 lbs.) of cast iron and 13,822 kilog. (30,408 lbs.) of wrought iron, or a total of 222,770 kilog. (490,094 lbs.)

The Glatt Viaduct has but three spans, namely two of 28.8 m. (94 ft. 6 in.) each and one of 36.0 m. (118 ft. 1 in.). Its two iron piers, each 28.64 m. (77 ft. 6 in.) high, consumed 242,983 kilog. (534,453 lbs.) of cast iron and 5,380 kilog. (11,726 lbs.) of wrought iron, or together 248,363 kilog. (546,179 lbs.).

The Sitter Viaduct is between St. Gallen and Winterthur; it was begun early in 1854, and was finished in March, 1856, or in a little over two years. This viaduct is built for a single track, and its total length from abutment to abutment is 163.6 m. (536 ft. 6 in.). Three cast-iron piers, 47.79 m. (156 ft. 9½ in.) high, are placed on piers of stone 10 m. (32 ft. 9½ in.) high, and divide the whole span into four panels, two of which have a span of 32.64 m. (107 ft.) each, and two others 38.4 m. (125 ft. 11 in.). The mean height of the viaduct is about 50 m. (164 ft.), and its cost amounted to nearly 350,000 florins (\$140,000).

In the three iron piers there were 917,560 kilog. (2,018,632 lbs.) of cast iron, and 36,722 kilog. (80,788 lbs.) of wrought iron, or together 954,282 kilog. (1,099,420 lbs.). The weight of the iron structure which carries the road and the superstructure amounts to about 346.7 tons.

The Sarine Viaduct near Freiburg in Switzerland was begun in 1857 and was opened to traffic in September, 1862. It is built for a double track; the two end spans are each 40 m. (131 ft. 2½ in.) long, and the five intermediate spans each 44.12 m. (144 ft. 9 in.) long. They rest upon pillars which consist of masonry up to a height of 38 m. (124 ft. 8 in.) above low-water mark, while their upper part is 43.32 m. (142 ft. 1 in.) long, and consists of 12 cast-iron columns each, joined and connected together by means of wrought-iron frames and ties. Measuring between the axes of the end columns, these piers are each 10 m. (32 ft. 9½ in.) long, and 6.2 m. (20 ft. 4 in.) wide at their base; they decrease in size, however, towards their tops, as well as in the direction of the axis of the bridge as perpendicular to it, so that they become 6.27 m. (20 ft. 7 in.) long and 4.68 m. (15 ft. 5 in.) wide at their upper end.

This viaduct measures 328.68 m. (1,078 ft.) between the abutments, and 396 m. (1,300 ft.) including the abutments, its mean height being 51.7 m. (169 ft. 8 in.); there was necessary for its construction about 3,150 tons of wrought and cast iron, 30,000 cubic metres (38,000 cubic yards) masonry, and 385 cubic metres (510 cubic yards) wood. In the six iron piers are 1,300 tons of cast iron and 650 tons of wrought iron. The price paid per ton was 184 florins (\$75.60) for cast iron, and 224 florins (\$89.60) per ton for wrought iron. The cost of constructing this viaduct amounted, in the aggregate, to about 900,000 silver florins (\$360,000 gold).

The Creuse Viaduct at Bussau-d'Aun is built for a double track. In April, 1863, the contract with the manufacturer, which was to furnish and erect the iron parts, was made to the effect that the erection should begin on Sept. 1, 1863, and should be finished by the end of August, 1864. Obstacles were, however, encountered which retarded it, so that the viaduct could only be given up for traffic a year and ten months after signing the contract, that is, Feb. 4, 1865.

The two end spans are respectively 45.25 m. (148 ft. 5 in.) and 41.25 m. (135 ft. 4 in.) long, while the four intermediate ones are each 50 m. (164 ft.) long.

The track lies 56.5 m. (185 ft. 4 in.) above the low-water line of the Creuse; the three middle piers consist each of eight cast-iron columns of 0.35 m. (14 in.) exterior diameter, and 0.05 m. (2 in.) thickness, with a length of 33.9 m. (111 ft. 2½ in.).

The columns are built of parts of 4.5 m. (14 ft. 9 in.) length, joined together by strong wrought-iron couplings. At the base of the columns are 3.4 m. (11 ft. 2 in.) apart (measured from axis to axis), while this distance decreases to 2.0 m. (6 ft. 7 in.) at the top. Thus each pier is 10.2 m. (33 ft. 6 in.) long and 3.4 m. (11 ft. 2 in.) wide at the base, but only 6.0 m. (19 ft. 9 in.) long and 2.0 m. (6 ft. 7 in.) wide at the top. These three iron piers rest upon stone piers, which rise to 17.6 m. (57 ft. 9 in.) above low-water mark, and therefore vary in height according to the level of the ground.

The stone piers under the first and last iron pier rise to a height of 31.3 m. (102 ft. 8 in.) above low-water mark, so that the iron piers proper are only 20.2 m. (66 ft. 8 in.) high.

Measuring from one end of the metallic bridge girder to the other, we find the length of the viaduct to be 286.5 m. (939 ft. 9 in.), while its mean height between these limits is 39.9 m. (130 ft. 10 in.). If, however, we include the four small panels which join the abutments, we obtain a length of 338.7 m. (1,110 ft. 11 in.) and a mean height of only 35.3 m. (114 ft. 9 in.).

The erection of each iron pier, including the attachments for girders, occupies on the average 20 days; the setting of the girder over one span, about 8 days.

The iron parts of the bridge truss-work, excluding the superstructure, weigh in the average 4,170 kilog. per linear metre (2,800 lbs. per linear foot). Each of the pillars, 33.9 m. (111 ft. 2½ in.) high, contains 99,407 kilog. (218,695 lbs.) cast iron and 56,118 kilog. (123,460 lbs.) wrought iron. The cast iron cost 172 florins (\$68.80) and the wrought iron 240 florins (\$96.00) per ton.

The total cost of the viaduct, which is 286.5 m. (939 ft. 9 in.) long, was about 540,000 silver florins (\$216,000 gold).

The Cere viaduct on the railroad leading from Pigeat to Aurillac, was begun in June, 1863, and finished Oct. 6, 1866, being opened to traffic Nov. 12, 1866. It is built for a single track, its total length being 308.5 m. (1,011 ft. 10 in.) while its length, measured between the ends of the abutments, is only 236.5 m. (775 ft. 9 in.).

Four iron piers are placed on stone piers, thus forming five spans, equal to those of the Creuse Viaduct, which we have just considered. The extreme spans are respectively 45.25 m. (148 ft. 5 in.) and 41.25 m. (135 ft. 4 in.) long, while the intermediate spans each measure 50.0 m. (164 ft.). The level of the track is 55.34 m. (181 ft. 6½ in.) above low water in the Cere, the extreme stone piers rise to 30.0 m. (98 ft. 5 in.), while the two intermediate ones rise to 16.3 m. (53 ft. 5½ in.) above low-water mark.

The metallic pillars are respectively 20.2 m. (66 ft. 3 in.) and 33.9 m. (111 ft. 2½ in.) high, and consist of eight cast-iron columns each, which do not form a four-sided frustum of a pyramid, as in the case of the Creuse Viaduct, but an eight-sided frustum. Measuring between the axes, we find the length of the pillars, which are 33.9 m. (111 ft. 2½ in.) high, to be 9.2 m. (30 ft. 2 in.) at the base, and 5.0 m. (16 ft. 5 in.) at the top, in a perpendicular to the direction of the bridge, while the width of the piers decreases from 4.6 m. (15 ft. 1 in.) to 2.5 m. (8 ft. 2½ in.).

Similarly, the piers 20.2 m. (66 ft. 3 in.) long, have the same dimensions as those given above.

The mean height of this viaduct is respectively 32.5 m. (106 ft. 7 in.) and 38.5 m. (127 ft. 3 in.). We take its total length as the length of the iron girders.

The iron parts of the panels, excluding the superstructure, weigh on the average 2,260 kilog. per linear metre (1,516 lbs. per linear foot). Each of the piers, 33.9 m. (111 ft. 2½ in.) high, contains 72,972 kilog. (160,539 lbs.) cast iron and 52,414 kilog. (115,311 lbs.) wrought iron; each of those 20.2 m. (66 ft. 3 in.) high, 44,634 kilog. (98,195 lbs.) cast iron, and 35,708

kilog. (78,558 lbs.) wrought iron. The cast iron cost 180 florins (\$72) and the wrought iron 250 florins (\$100 per ton.)

The Iglawa Viaduct was built for a single track near Elbenschutz in Moravia by the Austrian State Railroad Company. It is 373.5 m. (1,225 feet) long between the ends of the abutments, and is divided into six spans by five iron piers placed on stone piers, each span being 59.4 m. (194 ft. 10½ in.) long.

The track rests on a lattice truss, and its upper edge is 42.73 m. (140 ft. 1½ in.) above the low-water level of the Iglawa.

The stone pier of the first pier rises to 14.72 m. (58 ft. 3 in.) above low water, but those of the other three only to 9.72 m. (31 ft. 10½ in.).

Four cast-iron columns of 0.50 m. (1 ft. 7½ in.) external diameter and 0.41 m. (1 ft. 4 in.) internal diameter make up each pier, which has the form of a four-sided frustum of a pyramid. The first pier is 21.4 m. (70 ft. 2½ in.) high, but the other four each 26.4 m. (86 ft. 7 in.).

Measuring between the axes of the columns, the length of the piers is 4.8 m. (15 ft. 9 in.) at the top, and their width 2.8 m. (9 ft. 2 in.). The inclination of the columns is such that the four piers of 26.4 m. (86 ft. 9 in.) in length have each a base 9.52 m. (31 ft. 3½ in.) long and 5.55 m. (18 ft. 3½ in.) wide.

The columns are formed of tubes 5 m. (16 ft. 4½ in.) long and joined together by strong wrought-iron ties.

The total weight of cast iron in the viaduct is 296.6 tons, and of wrought iron 1,287.7 tons; the price of the former, including cartage, duty and erecting, was 194 florins, Austrian standard silver (\$97.60—\$92.88 gold), per ton; that of the wrought iron, 288 florins (\$115.20) per ton. This was paid to the firm of Cail & Co., which had undertaken the execution of the iron work.

Of the above-mentioned quantities, 6.3 tons of cast iron and 10.44 tons of wrought iron are in the trusses of the viaduct, its total length being 373.5 m. (1,225 feet), while the 21.4 m. (70 ft. 2½ in.) piers contain 49.2 tons cast iron and 34.3 tons of wrought iron; and the four other piers, 26.4 m. (86 ft. 7 in.) high, contain each 59.9 tons cast iron and 39.85 tons wrought iron.

Building the foundation and masonry cost 267,300 florins (\$128,306), while the iron cost 509,700 florins (\$203,980), taking into account the different quotations of silver; so that the total cost of this viaduct was 775,000 florins (\$310,000).

Since the main reason for choosing iron piers was on account of the rapidity of construction, the time necessary for building this viaduct presents special interest. The contract for the iron work was given to the above named firm Sept. 28, 1868. The official test was made about 23 months later, Aug. 20, 1870; and Sept. 15, 1870, it was opened for traffic.

The iron piers were erected by means of scaffolding, built on the finished part. The parts of the columns were carried to the foot of the piers, and there raised to their respective positions. The continuous lattice truss work which was to carry the track was put together at a place in the line of the viaduct and was thence pushed forward to the proper position. In order to diminish the length of the freely over-hanging part of the trusswork, a wooden pier was inserted between every two consecutive piers, when the truss-work would have hung over, thus doing away with a quantity of material which would otherwise have been necessary to keep the truss in shape. By taking these supports away immediately, the same timber could be employed two or three times.

Table No. 1 gives a summary of the time, in days, necessary for erecting each of the five piers, and shows that this work extended from Aug. 1, 1869, to April 30, 1870.

As stated above, the trusses were located by being pushed into position. In order to avoid the necessity of a large erecting shed, and also in order not to be forced to push the whole weight from the beginning, only a part of the whole length of the trusses, 373.5 in. (1,225 feet), was put together at first, and the remainder was attached gradually as the work advanced, until the whole length had been completed.

Table No. 2 contains the main data relating to the progress of the work upon the trusses, and it shows that it is divided into seven operations, the first beginning Aug. 1, 1869, and ending May 31, 1870, taking altogether about 10 months.

The Weissenbach Viaduct, at Laibach, Tarvis, on the Crown Prince Rudolph Railroad, is built for a single track. Its length, measured from abutment to abutment, is 132.72 m. (435 ft. 4 in.), and the two continuous lattice truss girders, between which is the track, are supported by two cast iron piers placed on stone. The axes of these two piers are respectively 39.33 m. (129 ft.) and 43.12 m. (141 ft. 5 in.) distant from their abutments, being placed 50.26 m. (164 ft. 10 in.) apart.

The heights of the iron piers from the top of the masonry to the support of the superstructure are respectively 27.46 m. (90 ft. 1 in.) and 18.71 m. (61 ft. 4½ in.). Each of the piers is formed by four hollow cast-iron columns, arranged so as to form a pyramid, and joined firmly together by wrought-iron cross ties. The tubes which form the columns have an external diameter of 500 millimetres (19½ in.) and an internal diameter of 414 mm. (1 ft. 4½ in.), their length varying from 3.0 m. (9 ft. 10 in.) to 4.4 m. (14 ft. 5 in.). The length of the piers is 2.213 m. (7 ft. 3 in.) at the top, measuring from axis to axis of the columns in the direction of the viaduct, and their width is 4.820 m. (15 ft. 9½ in.). These dimensions increase toward the base, the inclination of the columns being 1 in 20.8 in the direction of the viaduct, and 1 in 15.7 in the direction perpendicular to it.

The bridge trusses contain 299,250 kilog. (658,330 lbs.) of wrought iron, 3,950 kilog. (8,690 lbs.) of cast iron, and 1,165 kilog. (2,563 lbs.) of steel. The pier, which is 27.46 m. (90 ft. 1 in.) high, contains 61,100 kilog. (134,480 lbs.) of cast iron and 36,950 kilog. (81,290 lbs.) of wrought iron, while that of 18.71 m. (61 ft. 4½ in.) height contains 43,100 kilog. (94,820 lbs.) cast iron and 27,150 kilog. (59,730 lbs.) of wrought iron.

The material cost 200 florins (\$80) for cast iron and 260 florins (\$124.80) for wrought iron per ton, in silver.\*

This viaduct was begun Oct. 15, 1869, and the girders were finished Sept. 15, 1870. It was opened for traffic Dec. 14, 1870.

In order to be able to finish the erection of the iron piers in time, as well as that of the bridge girders, in spite of the tardiness in conveying the materials, they were begun at once, and a complete scaffolding was built for this purpose.

By these means it was possible to erect the two pillars in 19 days, and the bridge girders in 55 days.

Evident progress in the construction of iron piers is shown by four viaducts on the Commeny-Gannatz line of the Orleans Railroad. The length of the base, perpendicular to the direction of the viaduct, was made about three times as large in these iron piers as was formerly the case. This advantageous increase of the base was attained either by additional inclined stays which were attached to the straight columns (Boube & Sioule Viaduct), or by bending the columns themselves at their lower ends in such a manner as to increase their base more than would otherwise be the case with the straight columns. (Neuvial & Bellon Viaduct.)

The Boube Viaduct is divided into six spans by five iron piers, which are separated 50 m. (164 ft.) from each other and from the centres of the abutments. It is built for a single track; the three central piers have each a height of 37.50 m. (123 ft. 9½ in.); the two extreme piers, 41.50 m. (136 ft. 1½ in.). If no inclined stays had been used, the length of these piers at their bases, measured in a direction perpendicular to that of the pier, would have been respectively 7.4 m. (24 ft.

\* Mr. Pontzen doubtless mentions the price in silver florins because Austria, like this country, has a depreciated paper currency of fluctuating value. Prices are given in silver as we in America mention prices in gold, as a reference to a fixed standard.—EDITOR RAILROAD GAZETTE.



3 1/2 in.) and 6.4 m. (21 ft.) The inclined stays, however, increased the lengths to 20.8 m. (68 ft. 2 1/2 in.) and 19.55 m. (64 ft. 1 1/2 in.) respectively.

Each of the three larger piers contain 148,312 kilog. (326,286 lbs.) of cast iron and 45,051 kilog. (99,712 lbs.) of wrought iron; each of the two extreme piers, however, 119,000 kilog. (261,800 lbs.) cast iron and 32,600 kilog. (71,720 lbs.) wrought iron. The Neuval Viaduct is also built for a single track; one iron pier 37.50 m. (123 ft.) in height divides the viaduct into two equal spans, each 49.125 m. (161 ft. 1 1/2 in.) long, measuring from the centre of the girder supports.

The desired object of increasing the bases of the piers is attained in this case by curving the two lowest parts of the columns outward, instead of continuing them in a straight line. This pier consumed 86,484 kilog. (190,265 lbs.) of cast iron and 32,545 kilog. (71,600 lbs.) of wrought iron.

Though far from having considered all European viaducts with iron supports, I believe I have at least sufficiently recalled the main data of those viaducts with iron piers which have lately been mentioned most frequently. These data will enable us to judge by comparison the very similar structure in Peru, of which I will now give an account.

The contract for building the Verrugas Viaduct was given to the Baltimore Bridge Company by Mr. Henry Meiggs, the general contractor of the Oroya Railroad. This company adopted the plans of Charles H. Latrobe on the recommendation of Mr. W. W. Evans, Consulting Engineer for the Peruvian Government.

This single-track viaduct measures 175.35 m. (575 ft.) between the abutments, and is divided into four spans by three wrought-iron piers. The first three of these spans have each a length of 30.5 m. (100 ft.) while the fourth, joining the abutment nearest to Lima, has a length of 38.1 m. (125 ft.).

There are three iron piers rising directly from the ground and having heights respectively of 44.20 m. (145 ft.), 71.81 m. (235 ft.) and 54.25 m. (177 ft.). They are each 15.25 m. (50 ft.) long, in the direction of the viaduct, while their widths measured between the axes of the extreme columns of which they are formed, is 4.57 m. (15 ft.) at the top, which dimension increases toward the base by an inclination which is 1 in 12 in the extreme columns.

The erection of the metallic part of the viaduct was begun Sept. 17, 1872, and finished Jan. 1, 1873, that is, in 88 working days. In spite of this rapidity, which surpasses all our European conceptions, not the least accident or bruise occurred to any of the workmen engaged on the erection.

To build the viaduct, from the time when the first spadeful of earth was dug, had taken just 3 1/2 months, and on Jan. 8, just a week after completion, the first train, with three loaded cars, having a total weight of 2,680 cwt., passed over the viaduct, and neither then nor since has the least accident happened, although, as I am informed, the heaviest trains pass over it.

At the same time we must not forget that the grade rises going from Lima 30 millimetres per metre (158 ft. per mile), and that the trains pass from a curve of 107 m. (350 ft.) radius directly on to the viaduct, whence the track is a straight line. Each pier consists of 12 columns, combined together in a group of four in the form of an inverted W. These three groups are placed perpendicularly to the direction of the viaduct, being spaced 6.25 m. (20 ft.) apart and joined together into a whole by strong cross-ties and struts.

The two outer groups of columns of each pier consist of tubes of 0.305 m. (11 1/2 in.) external diameter, while the central group consists of tubes of only 0.203 m. (8 in.) external diameter, being formed of parts 7.16 m. (23 ft. 6 in.) long.

For the production of these wrought-iron tubes, the form of the Phoenix Iron Company, which is extensively employed in America, was used in the manner indicated by the annexed sketch. The tubes are composed of six segments, and those of 0.405 m. (1 1/2 in.) diameter, have a sectional area of 129 square centimetres (20 square in.), while those of 0.203 m. (8 in.) diameter consist of only four segments, having a sectional area of 84 square centimetres (13 sq. in.). Cast iron was used in small quantities, as for instance in the couplings which join the elements of the columns and to which the cross ties and struts are attached.

Table No. 3 contains the classified weight of cast and wrought iron used in every part of the viaduct, as well as the total amount.

The load on the columns of 0.305 m. (11 1/2 in.) diameter is 325 kilog. per square centimetre (4,612 lbs. per square inch) at the base of the highest column, if we take into account the weight of the column itself and that of the truss work, as well as an accidental load of 3.3 tons per lineal metre (one ton per lineal foot) of the track, but without considering the additional strain due to the force of the wind, while the load on the base of the columns of 0.203 m. (8 in.) diameter is only 220 kilog. per square centimetre (3,122 lbs. per square inch).

The greatest tensile strain on the wrought-iron parts of the bridge truss nowhere reaches 840 kilog. per square centimetre (11,920 lbs. per square inch). Tests were made to determine the absolute strength of the wrought iron employed, and these gave more than 4,200 kilog. per square centimetre (59,600 lbs. per square inch), so that the above strain was assumed to be sufficiently within the limits of safety. Furthermore care was taken to test by means of hydraulic presses each important tension rod up to 1,400 kilog. per square centimetre (19,866 lbs. per square in.) before it was used in the construction of the bridge.

The total cost of this viaduct was 343,000 florins (\$164,640) silver, exclusive of the very small expense for excavating and masonry. This amount was distributed as follows:

	Florins.
All iron piers and truss—25 feet—on board a vessel in the port of New York.....	259,300
Freight, including insurance, commission, clearance money, and transportation to the spot where the material was used.....	41,200
Apparatus and tools used in erecting.....	19,700
Cost of erection.....	24,800

Total, as above..... 343,000  
Which is equivalent to..... \$164,640

We must here remark that if this viaduct had not been built in South America, but in the United States, the cost of erection would have been less than one-half of that given above, or only about 10,000 florins (\$4,800).

Besides the almost exclusive employment of wrought iron and the great width of the piers, 15.25 m. (50 ft.), which caused a very perceptible diminution of the length of the four spans, the main characteristic of this viaduct is the joining together of the separate parts of the piers and trusses by means of bolts or pins.

This manner of joining the various parts undoubtedly favors a rapid construction, by doing away with riveting the work in its destined location.

When the structures are to be erected in remote districts, far from any industrial center, which happens frequently in America, it is necessary to reduce the work outside of the shop to a minimum, but even in our country this tendency would have a very favorable effect. The larger structures of our railroads are usually at a considerable distance from the shops where

\* The regulations which were issued by the Imperial Board of Trade, Aug. 30, 1870, with regard to measures to be taken for safety in building iron bridges for railroads, state in Paragraph 2 that an accidental load of four tons per lineal metre of track is to be taken as a basis of calculation in spans of 30 m. (100 ft.) or more. (The Verrugas Viaduct belongs to this class.) In P. No. 3 of the same regulations the maximum strain on wrought iron is placed at 900 kilog. per square centimetre (11,852 lbs. per square inch).

the parts were made, so that the construction of a large iron bridge usually necessitates the erection of expensive temporary shops, in which the work can scarcely ever be executed as precisely as in the factory itself and in no case as cheaply.

The advantages derived by shortening the time necessary for erecting an iron structure, due to the diminution of the work done at the place, not only benefit the railroad which uses this structure, but also the much-frequented roads and rivers which are bridged over, since the interruption of traffic on such roads will thereby be diminished, both in amount and time.

In America these considerations, with others of equal weight, led to the preference of the trusses invented by Fink, Post, Pratt, Whipple and Bollman, which were erected at Fink, Post, Pratt, not by riveting, but by the pin and tenon and socket connections, so that the riveted lattice truss and other bridge trusses soon became obsolete.

If a viaduct like the one over the "Agua de Verrugas," had been built by means of riveted bridge-trusses, it would have been necessary to adopt one of the following plans: Either an erecting shed would have been necessary in the prolongation of the viaduct, and the strengthening of the piers; or the erection of a very strong temporary bridge on which the work could have been done; so that this construction necessarily would have cost much more time and money than the Fink truss and the piers of the Verrugas Viaduct, which were constructed just as rapidly.

The original plan was to erect the first and last spans on scaffolding, and to set up the intermediate ones in the valley, whence they were to be raised to their respective positions. Crabs attached to the piers themselves were to be used to raise the parts from the valley to their positions, and thus the piers were to be built up.

Mr. L. I. Buck, who had charge of this work, solved this problem in a much more ingenious manner. He erected a temporary structure at each end of the viaduct, and stretched two strong wire ropes across the valley between these temporary wooden towers. The various parts of the piers were brought to the abutment nearest Lima; there they were hung on running blocks, which were attached to the wire ropes, and thus they were conveyed to their destination.

In a similar manner the parts of the truss were stored near the same abutment, and were thence also transferred to their positions. In order to connect these parts, a scaffolding was hung on the wire ropes which stretched across the valley, and this was used first for mounting the span of 38.1 m. (125 ft.) length, and then it was moved forward, was attached to the finished piers, and served for connecting the other spans of the truss, each 30.5 m. (100 ft.) long.

This procedure, which reminds us vividly of the construction of the piers of the Freiburg Viaduct, or the arched bridge over the El Kantara valley in Algiers, can only be imitated under certain circumstances, but it must be called a very fortunate choice under the given conditions.

The workmen whom Mr. Buck employed were mostly deserters and sailors, who were not familiar with the work of blacksmiths and machinists, but were all the more apt in climbing and hoisting; and as the operations to be performed were very simple, and the height at which the work was to be done on an unsteady scaffolding, was quite considerable, they were found to be very efficient under good overseers.

The only accident which happened during the work was caused by the breaking of a rope. One of the parts of the third pier fell into the valley from a height of 30 m. (100 ft.). In order that there might be no interruption to the work, a corresponding part, which was to be used in the centre pier, was used in its place, and the injured part was repaired at Lima in time to prevent any interruption of the work.

After having described the manner of doing the work, the following details as to the time spent in erecting the various parts of the viaduct may be of interest:

Pier No. 1, height 44.20 m. (145 ft.)	Time, 12 days.
Pier No. 2, height 71.81 m. (235 ft.)	Time, 10 days.
Pier No. 3, height 54.25 m. (177 ft. 11 in.)	Time, 18 days.
The bridge bay of 38.1 m. (125 ft. span.)	Time, 5 days.
One bridge bay of 30.5 m. (98 ft. 5 1/2 in.)	Time, 23 hours.
One bridge bay of 30.5 m. (98 ft. 5 1/2 in.)	Time, 16 1/2 hours.
One bridge bay of 30.5 m. (98 ft. 5 1/2 in.)	Time, 18 hours.

The progress made in the construction of iron piers, within the two past decades, is shown by a comparison of the weights of piers built in this period. For information on this point, I refer to Table No. 4, which gives a lucid idea of the amount of cast and wrought iron used per metre of height in each pier of several of the viaducts which we have considered, also conclusions for the purpose of comparing the costs.

This comparison shows that the increased or almost exclusive employment of wrought iron, which may safely be called a more appropriate material for piers than cast iron, has diminished the cost, or at least has not increased it.

The above statement apparently contradicts the conclusion to be drawn from the cost of the well formed piers of the Boule and Neuval Viaducts, when compared with the cost of the piers of the Verrugas Viaduct; but this contradiction is only apparent, for the piers of the French viaducts are only 2.50 m. (8 ft. 3 1/2 in.) wide at the top in the direction of the viaduct, while those of the Verrugas Viaduct have a width of 15.25 m. (50 ft.). This width diminishes the cost of the trusses considerably, and not only in proportion to the decreased length, but also by means of the decreased weight of the trusses per lineal metre. In order to make a correct comparison of the relative cost of the Verrugas Viaduct and the other viaducts, we would necessarily have to subtract at least the cost of the trusses of 15.25 m.—2,501 m.—12.75 m. (41 ft. 10 in.) from each of the piers of the Verrugas Viaduct.

If we take for our basis of calculation the amount of cast and wrought iron used in the span, 38.1 m. (125 ft.) long of the Verrugas Viaduct, and assume the prices given in Table No. 4, we find that there is a saving of 2,650 florins (\$1,273) on the piers of 44.20 m. (145 ft.) height, that is, 60 florins per metre (\$28.80 per foot) of height; on the pier of 71.81 m. (235 ft.), 34 1/2 florins (\$16.56); and on that of 54.25 m. (177 ft. 11 in.), 48.8 florins (\$23.42); so that if we reduce our comparison to the equal width of 2.50 m. (8.20 ft.), we must use the respective prices of 677 florins (\$325.39), 699.9 florins (\$336), and 652.6 florins (\$313), in comparing with other viaducts.

Naturally, such a comparison is based on the assumption that the similar materials are equally strained, or, to state this more generally, that equal safety has been attained in the various materials used in the structures.

Although I neither know the strain brought to bear on the various parts of all European viaducts, nor possess the data which would permit an exact determination of these strains, I think that I am justified in assuming, beyond doubt, that these structures, which were executed under the control of the various governments, offer sufficient safety in all possible cases of actual use.

Similarly the limits of safety in all bridges built by the Baltimore Bridge Company,\* the acknowledged capability of the engineers, and finally the experience, up to date, with regard to the behavior of the Verrugas Viaduct itself—all these justify the assumption that this viaduct has also been proportioned so as to offer sufficient safety. I have frequently remarked that our American colleagues are generally unjustly accused of sacrificing safety for rapidity and cheapness; and I will therefore add that I have used all the data which were at my disposal, in order to calculate the maximum strain on the iron of the piers of the Verrugas Viaduct, taking into

\* Up to Jan. 1, 1873, this bridge building company had built bridges amounting in all to a span of 13 1/2 kilom. (8 1/2 miles), using altogether 11,880 tons of iron.

account the very important influence of the wind, and I have found that at the foot of the highest pier the thrust did not amount to 800 kilog. per square centimetre (11,352 lbs. per square inch), and the tension to 150 kilog. per square centimetre (2,090 lbs. per square inch).

It is very probable that these maximum limits are never reached in practice, for the most favorable conditions were assumed for this calculation, as, for instance, a pressure due to the wind of 275 kilog. per square metre (56 lbs. per square ft.) which corresponds to a velocity of 45 m. (148 ft.) per second—that of the most violent tornado. Even those parts of the piers which were sheltered by others were assumed to be acted upon directly by the wind, as Mr. von Nordling recommends in the previously mentioned article, and the wind was assumed as blowing in the most unfavorable direction.

The consideration of the Fink system of bridge truss, used in the Verrugas Viaduct, does not strictly belong in the limits which I had drawn for this notice, but I think it is my duty to say a few words about this system in general, as it is eminently a specimen of the modern American bridge construction.

The well known American engineer, Mr. Charles Bender, makes the following remark in comparing the American and European trussed bridges in Vol. XVII. of the *Journal of the Society of German Engineers*: "America at present possesses a system of iron trussed bridges which surpasses any of the European ones, not only as regards strength and simplicity, but also cheapness and carefully determined proportions."

In the Vol. XXVI. of "The Journal of the Austrian Society of Engineers and Architects" an article was published by Prof. E. Winkler, which estimates the theoretical knowledge of the above named engineer as pretty low.

I do not feel called upon to defend the theoretical knowledge of all the prominent engineers who praise the system of American bridges, but neither do I see any occasion to withhold my opinions about this system of bridges, merely on account of the judgment passed upon one of them by Prof. E. Winkler.

The tendency in Europe is to construct the truss work of plates, flat-iron, angle-iron, or other bars of various profiles, which are not prepared any further than by straightening, measuring them, and punching the holes for the rivets. In America, on the other hand, riveting is avoided at the place of erection, and the various parts are proportioned in such a manner that neither the cross-section nor the strength is diminished at the points where the strong bolts or pins are used for connection. The rods which are to resist tension have an eye at each end for the connecting bolts, and are forged especially for this purpose in the necessary form, while the struts which resist thrust are formed in such a manner at their ends that they receive and transmit the thrust on the whole cross-section. While the rolled parts for riveting must necessarily be too heavy at other points if they are to be strong enough at the rivets, this is not the case with the American tension rods, which resemble chain links. In the riveted struts the thrust is transmitted at the connections by the resistance of the rivets to shearing, and the friction of the two surfaces of the combined parts. In the American construction, on the other hand, the thrust comes directly upon the struts themselves, which are nicely fitted.

The eccentric transmission of force and the consequent moments of rotation, both in tension and compression, are therefore avoided by the American construction. It is evident that riveting cannot be avoided completely, even in the American bridges, since the single parts cannot be made of one piece beyond a certain limit, but the riveting is done in the shops and not on the spot where the structure is erected, and it is particularly avoided if the parts are already exposed to any strain.

The theoretical strain of the simple elements of the truss agrees more closely with the actual strain the simpler we make the construction, since the successive action of the single parts, which results from the inexactness of the work, is thereby avoided.

In the construction of European bridges, the tendency also has of late been to approach the simpler systems. But since riveted connections are always stiff and rigid, and the transmission of force is frequently eccentric, the reason is evident why even in a simple system the theoretical estimate must always vary from the actual.

A bridge built on the American plan will therefore always offer more safety than one built on the European plan, even though the maximum theoretical strength of both may be the same. The variations from the calculated strength will be different in the latter, according to the care bestowed upon the work in the place of construction, while this will not be the case in American bridges, in which the same care is bestowed in the shops on the length of the various elements and the holes for the bolts, which are accurately drilled.

With the same safety the trussed bridges after the American system may be made lighter, as well for the reasons already given, as also on account of the absence of the joint and packing plates, which are necessary to strengthen the weakened parts in riveted trusses, and at the ends of tension rods, as also to prevent warping.

We must further mention that the thin, flexible parts of bridges which are transported to the structures in our country, can be bent and injured much more easily than the finished bridge elements of the American constructions; and also that corrosion (that dangerous enemy of all iron structures) finds a greater number and many less protected spots in our bridges, composed of their plates joined by many thousands of rivets, than in those of American origin.

We must repeat here, as the main argument in favor of the trusses with bolt and pin connections, that a great advantage is gained by means of the lighter, quicker and less expensive construction.

That these advantages are real is shown by the observations which were made lately, as for instance in Canada, where the contracts for the supplies and construction of many bridges were recently granted to American in preference to competing English firms, although the railroad leading from Quebec to Halifax, which used these bridges, was under the exclusive management of English engineers. In this competition, the coefficient of safety was fixed for each material, while the choice of the system had been left to the competing firms.

Similarly, the English engineers of the Grand Trunk Railway in Canada preferred the American system to the so-called English in building the International Bridge of 75.60 m. (248 ft.) spans over the Niagara. The well-known English Chief Engineer, Mr. E. Hannaford, whose name has been mentioned frequently of late—since he succeeded in changing the broad gauge of the Grand Trunk Railway into the standard gauge in 27 hours, over a distance of 550 miles—writes as follows to the Phoenixville Bridge Company about American bridges, of which he has already constructed twelve, having spans of from 24 m. (78 ft. 9 in.) to 50 m. (164 ft.).

"They have given complete satisfaction in all cases, and have fully merited confidence. The facility and rapidity of construction, the connection, by which each element takes the work and strain assigned to it, are properties which speak in their favor, and which insure their superiority above the riveted and lattice bridges."

With special reference to the Niagara Bridge, this engineer remarks:

"I have finished the International Bridge over the Niagara near Buffalo, for which your works furnished the trusses. They are perfectly satisfactory in all respects, and the facility and rapidity with which they have been erected, by the aid of floating rafts, was, I believe, of great importance in the rapid completion of this structure. The depth and strong current



of the Niagara River\* would have made other scaffolding very unreliable, if not impossible. For the erection of one of your trusses of 75.6 m. (248 ft.) length, we were engaged from 8 to 10 days, having only common workmen in charge of a foreman who was familiar with the construction of such bridges."

The prominent English engineer, Captain Tyler, of the Royal Engineers, recognized the advantages of this construction in a similar manner to Mr. Hannaford, after having examined the bridge and being present at the trials.

This recognition of the American system of bridges by the English engineers named above has double weight, for the reason that they are very competent judges, and because their just national pride is a guarantee that they judged severely.

The railroads of America erect almost exclusively such bridges, connected by piers, and even such railroads as the New York Central, which used riveted lattice trusses exclusively, have long since begun to adopt the modern American trussed bridge.

Having spoken of the advantages of the American iron constructions, I dare not close without admitting that these bridges have disadvantages in several respects, as, for instance, because they are lighter than the lattice truss bridges, the pro-

TABLE NO. 1.

Pier.	Height of iron in piers.		Weight of materials in tons.		The construction was		No. of work- ing crs.	
	No.	M'trs	Feet.	Cast iron.	W'r't iron.	Begun.		Ended
1 ..	21.4	70 ft. 2½	in.	49.2	34.3	{ Aug. 1 1869.	Sept. 15	45
2 ..	26.4	86 ft. 6	in.	59.9	39.85	{ Aug. 1 Sept. 15	Sept. 15	45
3 ..	26.4	86 ft. 7	in.	59.9	39.85	{ Sept. 15 Nov. 15	Dec. 15	45
4† ..	26.4	86 ft. 7	in.	59.9	39.85	{ Nov. 15 1870. April 8	{ 1870. April 30	52
5† ..	26.4	86 ft. 7	in.	59.9	39.85	{ Dec. 1 1870. April 8.	{ Jan. 1 April 30	52

TABLE NO. 2.

Moves.	The Move was		No. of days employed.	The distance moved was, each.		Together.	
	Begun.	Finished.		M'trs.	Feet and in.	M'trs.	Feet and in.
1..	1869. Aug. 5	1869. Aug. 9	5	55.6	182 ft. 4 in.	55.6	182 ft. 4 in.
2..	Oct. 5	Oct. 15	11	76.10	249 ft. 3 in.	131.6	431 ft. 7 in.
3..	Nov. 10	Nov. 21	12	55.5	182 ft.	187.1	613 ft. 7 in.
	1870.	1870.					
4..	Jan. 10	Jan. 16	7	36.8	120 ft. 7 in.	223.9	734 ft. 2 in.
5..	April 27	April 30	4	24.0	78 ft. 7½ in.	247.9	812 ft. 9½ in.
6..	May 10	May 17	8	66.5	218 ft. 1½ in.	314.4	1030 ft. 11 in.
7..	May 25	May 31	7	59.1	194 ft. 1 in.	373.5	1225 ft.
	Total....		54				

REMARKS.—The number of rollers on which the structure was moved was successively increased from 40 to 50; the number of workmen employed varied from 34 to 47.

TABLE NO. 2.—CONTINUED

Moves.	The move was		No. of days employed.	Iron structure moved.		
	Begun.	Finished.		Length, Meters.	Feet and inches	Weight, tons.
	1869.	1869.				
1 ....	Aug. 5	Aug. 9	5	162.9	534 ft 4 in.	880
2 ....	Oct. 5	Oct. 16	11	238.1	781 ft.	890
3 ....	Nov. 10	Nov. 21	12	263.3	863 ft. 7½ in.	653
	1870.	1870.				
4 ....	Jan. 10	Jan. 16	7	328.5	1077 ft. 6 in.	800
5 ....	April 27	April 30	4	363.5	1192 ft. 3 in.	1030
6 ....	May 10	May 17	8	373.5	1225 ft.	1030
7 ....	May 25	May 31	7	373.5	1225 ft.	1030
	Total ...		54			

TABLE NO. 3

NAME.	In first pier, 44.20 m. (145 ft.).	In second pier, 76.84 m. (252 ft.).	In third pier, 54.25 m. (177 ft. 11 in.).	In a bridge span of 38.1 m. (115 ft.).	In a bridge span of 30.5 m. (96 ft. 5½ in.).	In the whole viaduct, 373.5 m. (1,225 ft. 6 in.) long.
Cast iron.....	16 T. 835 K.	23 T. 706 K.	17 T. 845 K.	3 T. 190 K.	3 T. 200 K.	68 T. 175 K.
Wrought iron.....	113 " 725 "	200 " 710 "	183 " 990 "	28 " 210 "	19 " 855 "	536 " 200 "
Total.....	130 T. 560 K.	224 T. 415 K.	151 T. 835 K.	31 T. 400 K.	23 T. 655 K.	604 T. 375 K.
	Per metre. 380 kil. 840 lbs.	Per metre. 310 kil. 687 lbs.	Per metre. 330 kil. 730 lbs.	Per foot. 85 kil. 187 lbs.	Per metre. 57 lbs. 105 kil. 231 lbs.	Per metre. 185 kil. 410 lbs.
Cast iron.....	2,675 "	2,610 "	2,470 "	740 "	493 "	1,435 "
Wrought iron.....	1,717 "	1,740 "	1,647 "	493 "	434 "	957 "
Total.....	2,955 kil. 6,588 lbs.	2,920 kil. 6,477 lbs.	2,800 kil. 6,167 lbs.	825 kil. 1,827 lbs.	550 kil. 1,215 lbs.	1,620 kil. 3,597 lbs.

TABLE NO. 4

Name of viaduct.....	Sarine.			Cruse.	Glatt.	Thur.	Sitter.	Cere.		Iglawa.		Weissenbach.		Double.		Neuvial.	Verrugas.		
Finished in year.....	1862.			1864.	1855.	1856.	1856.	1866.		1870.		1870.		1871.		1871.	1873.		
Number of tracks.....	2.			2.	1.	1.	1.	1.		1.		1.		1.		1.	1.		
Height of piers: In metres.....	43.32	33.90	20.20	23.64	14.67	47.79	33.90	20.20	26.40	21.40	27.46	18.71	57.50	41.50	37.50	44.20	96.81	54.25	
" feet.....	142 f. 1 in.	111.2½	66.3	77.6	48.1½	156.9½	111.2½	66.3	86.2½	70.2½	90.1	61.4½	188.7½	136.1½	123	145	252	177.11	
Weight:																			
Cast iron { in kilos. per m. ....	5,701	2,932	2,941	5,138	4,745	6,400	2,163	2,210	2,267	2,290	2,225	2,303	2,580	2,800	2,806	380	310	330	
" { " lbs. " " foot.....	5,314	1,955	1,961	3,438	3,143	5,143	1,483	1,479	1,531	1,532	1,535	1,567	1,720	1,867	1,837	283	207	220	
Wrought iron { in kilos. per m. ....	2,501	1,655	1,932	113	514	2,561	1,546	1,768	1,509	1,603	1,346	1,481	740	767	868	2,575	2,610	2,470	
" { " lbs. " " foot.....	1,667	1,103	1,288	75	209	1,707	1,031	1,179	1,006	1,069	897	987	527	511	679	1,717	1,740	1,647	
Total:																			
Kilos. per m.....	7,502	4,587	4,873	5,251	5,055	8,961	3,699	3,978	3,778	3,902	3,571	3,784	3,328	3,567	3,174	3,958	2,920	2,800	
Lbs. " foot.....	5,001	3,068	3,249	3,500	3,373	5,974	2,466	2,652	2,517	2,601	2,380	2,802	2,347	2,378	2,116	2,955	1,947	1,867	
Cost:																			
At the rate of 180 florins (\$86.40) per ton of cast iron, and 260 florins (\$124.80) per ton of wrought iron—																			
Per metre of bridge, florins.....	1,504.44	958.06	1,031.70	594.22	935.74	1,817.86	789.50	857.48	800.76	880.60	750.46	791.80	658.88	703.42	640.76	737.90	734.40	701.00	
" foot " " dollars.....	\$226.98	\$140.26	\$161.32	\$87.15	\$137.25	\$266.62	\$115.81	\$126.77	\$117.45	\$121.82	\$110.07	\$116.13	\$96.63	\$103.17	\$93.97	\$108.23	\$107.71	\$102.90	

portion of the weight of the bridge itself to that of the train passing over it is smaller, and can, therefore, be called more unfavorable. The vibrations of the iron are greater in light bridges; and although no data exist as yet which enable us to calculate the deleterious influence of these vibrations upon the strength and consequent life of iron constructions, it can no longer be denied that such an influence exists, and that after the construction of the safe, these bridges will be less than when the structure was first erected.

German Theorists and American Bridge Engineering.  
NEW YORK, MAY 9, 1876.

TO THE EDITOR OF THE RAILROAD GAZETTE:

You have had the kindness to send me a copy of Mr. Ernest Ponzen's valuable article on the Verrugas Viaduct, which I read with a great deal of interest. There is no doubt but that, in time, when in Europe the better class of American structures shall become known, their advantages will be appreciated. Up to date, Continental practical bridge engineers know little or nothing about the specific constructions developed and perfected in the United States, and the impressions which lead to adverse opinions are based on the descriptions of antiquated details of cast and wrought-iron Bollman, Whipple and Fink trusses. Europeans generally do not know what strains per square inch are used here in tension or compression. Their data as to the rolling loads in use in the United States are those of constructions built 20 years ago, and of the modern American details they generally are totally ignorant.

European truss-bridges, with the exception of some complicated forms with curved chords, are *American trusses* built in iron with the adoption of the *exclusive* use of the rivet joint introduced by England. Essentially, therefore, the present European structures are imported from America to England, remodeled in England as regards material and details, and finally exported to the Continent.

*Thorough* experiments on riveted connections such as are used in practice never have been made on the Continent. Whole girders of execution like that relied on in practice never have been made.

But what has been neglected in regard to really scientific research, such as has caused progress since the introduction of experiment, Continental and especially German professors of engineering have believed themselves able to make up for by theoretical lofty *deductions* built on hollow physical foundations.

The majority of them have laid aside Aristotle, but the scholastic method is still deeply rooted in their brains.

Practical men have advanced art and science which, by these professors living in an impossible world of their own, have been rather veiled by the fog of their pseudo-science. Books filled with the most abstruse, most unreliable and most delusive mathematical rubbish are poured forth from their study-rooms, seldom in one, but more frequently in two and more

† The work on the fourth and fifth piers was interrupted on account of the rupture of several tubes, for which others had to be obtained.

heavy volumes, the real essence of which could be condensed into a small pamphlet.

While in the United States the natural course leads engineers to study thoroughly *one* branch; German students, as a class, are taught by their professors, "to embrace all that is in heaven and on earth," and being on this "right track" most of them follow it to the end of their lives, and filled with the excellency of their scientific education, and with the power of their theoretical knowledge, when once risen to position they they do not even admit an attempt to demonstrate that what they believe to be science is mere ballast.

A man of this kind is Professor Winckler, of Vienna, who certainly never built a bridge, and more than any other professor of the German school, perhaps, builds his palaces on sand, looks down on American practice which he does not know, ornaments his science with barren formulæ, disgusts sensible readers of his books by his utter want of practical knowledge, while he puts students in the condition of the poor scholar in Faust, who says: "I feel as stupified from all you have said as if a mill wheel whirled in my head."

In fact, he and many others like him *abuse* engineering topics in order to make common algebraic exercises. The mathematics of commercially practicable bridge-building are exceedingly simple, such as any bright mechanic can be taught in a short time; but those professors, instead of simplifying problems, have only the talent for complicating them. They are thoroughly superficial as regards the physical premises of their formulæ, such as quality and value of materials, workmanship and the like, but extremely abundant in formulæ, the greatest part of which is worse than worthless. And since the schoolboys in whose midst they live cannot or dare not express any doubt as to the full truth of all that the oracle says, schoolmasters fall into the superstition that all that they write is pure wheat, when it is but husks, and that they themselves are the safe pillars of industry.

I am far from throwing stones at those professors who recognize that their vocation, for which they are paid, is to teach students in the shortest possible time the fundamental principles of engineering with the least addition of ballast, who trust that any student who has learned mathematics can make his applications himself, and who use their leisure time in learning what the engineering profession does or did, that they may be able to tell this to their scholars. At all events, polytechnic schools only *prepare* young men to become but do not make them engineers.

Those European engineers who have enjoyed a good practical education, who have actually studied American design, who have built bridges, or those who have shaken off from their shoes theoretical, but by no means scientific, school dust, hold other opinions than those of the visionary engineering mathematicians mentioned.

Thus Professor Sternberg, of Karlsruhe, a gentleman who has worked practically, always has been a warm admirer of American design, and justly gave credit to the principles of

construction furnished to Europe by Town, Long, Howe, Pratt, Whipple and others, and he has also, in a letter directed to me July 5, 1870, indorsed the ingenious modern American practice of truss bridging and of the viaducts introduced by Menara, Smith and Latrobe, which I had described to him, and of which I had furnished him with drawings and photographs.

Immediately upon the appearance of the comparison of American and European bridges in the papers of the German Society of Engineers, the President of the largest bridge-building works in Germany, who executed the Coblenz arch bridge, the Kaylemburgh bridge in Holland, the Elbe bridge at Hamburg, and the exhibition buildings of Vienna, so much agreed with the principles of American design that he invited me to introduce the American systems of bridging at their works.

That Mr. Pontzen in his paper on Mr. Charles Latrobe's beautiful Verrugas Viaduct also indorses American practice, with many other *practical* German engineers whom I had occasion to hear, simply gives credit to his experience and to his judgment, being clear and free from preconceived school notions.

The American Centennial Exhibition certainly will not fail to increase the number of these men.

CHARLES BENDER.

### The Iowa Railroad Law and Similar Legislation Considered from the Popular Side.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I thank you for your fairness in publishing my communication on this subject in your issue of April 21. The importance of the question must be my apology for pursuing it further. In saying that the cases of unjust discrimination therein stated give no just cause for the State of Iowa to pass such a law and maintain it on her statute books in spite of the venal clamor raised by railroad organs, is to pay her people a somewhat doubtful compliment. Men must indeed be closely allied to angels or—fools—to submit forever to the most bare-faced plucking, and when continually smitten on the one cheek, forever turn the other for like treatment.

The railroad managers of the West have themselves alone to thank for the volleys of restrictive, hostile laws which they have provoked into existence in all the Northwestern States. They have never attempted, in any way, to conciliate or cultivate a friendly feeling with their patrons, who have always been treated as inferiors who are honored by being flayed alive. Non-resident youngsters from the East, or most dubious character and of still more dubious capacity, have been given the highest places, and the more they insulted the people and the less they were liked, the better they suited their employers. Perjuries the most bare-faced, and sworn statements which never contained a solitary truth, have been resorted to, to deceive and discourage resident stockholders and induce them to part with their property for nothing. No limits have been placed on tariffs, except the caprice and rapacity of those who made them.



In 1873, President Foster, in addressing the Iowa Horticultural Society, asserted that he had been compelled to pay the Rock Island road \$84 a car for 92 miles' transportation on that road, and this had been graciously conceded as a special rate and extreme favor. At the same time freight was carried 1,000 miles from the seaboard to Chicago for \$80 a car, \$4 less, and has since that been brought 1,200 miles, to the Mississippi River, for \$54 a car, \$30 less.

About the same time an Iowa dealer bought a steamboat load of Ohio River salt, which was unloaded at the wharf of an Iowa town. That dealer found it as utterly impossible to move his salt in any direction as if there had not been a railroad within a thousand miles. Hundreds of cars of lake salt whisked by, but his could not be moved. In vain did he appeal to presidents, superintendents, both general and division, and freight agents, general and special, as well as commercial agents and the whole tribe of salary-grabbers and railroad income-eaters. None would or could come to his relief. Before the barrels rotted away entirely, the article was shipped back where it came from.

This spring of 1876, before the inauguration of the Alton railroad war with the Iowa pool, an Iowa agricultural implement factory contracted to deliver a quantity of its wares in the interior of Nebraska, Kan., paying \$110 a car-load freight. Heavy liabilities were incurred for raw material, when this war knocked rates down to \$75 a car from Chicago to Lincoln and Omaha—\$35 a car less for 200 miles' further hauling. In vain were the ring officers appealed to. Both parties at each end were compelled to suffer without any offer of relief. Surely business men, in these prostrate times, have enough to contend with without encountering these reckless and entirely uncalled-for slaughters, the whole tendency of which is to prostrate and bankrupt the business men of the interior for the benefit of great railroad centres like Chicago. I inclose you a circular, recently issued, which shows the apprehensions these men continually feel, knowing the numerous hostile weapons perpetually suspended over their heads by less even than a single hair, though they are utterly devoid of any offense whatever, except trying to build up trade and manufactures in the cities west of Chicago, on the lines of railroads which in turn ought to sustain them, though they do not do so, by any manner of means whatever.

Of course, you will say: concede all this, two wrongs never make a right. The people of Iowa deny any wrong, or intention of any, in their action toward railroads. All have prospered since that law was passed who could live at all before, and nearly all have largely increased their receipts, as your own columns testify. In August last you showed that even the Keokuk & Des Moines road had increased 46½ per cent. in July, 1875, over the same month the year previous, when the law was not in existence.

The case of the first English road was cited to prove that even at that early day, 50 years ago, railroads were restricted in their charges. The people will act wisely if they always and forever reserve to themselves the right thus to restrain those who ought always to be useful servants, but who are only too ready to degenerate into intolerable tyrants. This right once fully and entirely beaten through the hair and into the heads of railroad men, and affirmed, as it certainly will be, by all the courts, sooner or later, the necessity and provocation for enacting these restrictive laws will, it is hoped, be to a great extent obviated. Mr. Lincoln was certainly right when he declared that to the people belong Congress, courts, legislatures and executives. It is equally certain that railroads, even if owned and controlled by non-residents, are no more sacred or beyond the reach of legislation than any other species of property located in the State, and that they can be, and ought to be, as fully restricted as grist mills, toll bridges and roads, or fences and warehouses owned by residents. This has been so often affirmed by the courts as to be no longer debatable or doubtful.

That railroads cannot and do not control themselves, must be apparent to the most rabid worshipper of power in this peculiar form. That their owners do not properly care for them, is equally evident. Not ten years ago, Michigan Central stock sold at 157, and was considered an excellent investment for widows' and orphans' trust funds. It has paid no dividend for years, and recently sold down to 51. Worthless branches foisted on to the main line by those who ought to have done far differently, and uncalled for railroad wars, have wrought this ruin. "I told you that your worthless kittens would soon dry up the old cat," was the homely metaphor of a disgusted stockholder to the distinguished President, who still blandly smiles, as he punctually draws his pay from a depleted treasury, which never contains any funds for those whose capital constructed the road.

As these men are both unable and unfit to govern themselves, I not only favor State laws to control them, both drawn up and enforced by men as skilled as those who now openly violate them; but such an Association as that lately outlined by Mr. Fink, in your columns, with power to compel the obedience of refractory members, also seems to be an indispensable necessity. Any form of restriction that will prevent these ferocious Kill-kenny felines from devouring each other till not even their tails are left, seems to be a consummation most devoutly to be wished, for the welfare of all, both public and railroad stockholders.

A permanent, total cessation of these diabolical contests, which injure everybody and help nobody, ought to be forthwith inaugurated, and it cannot be done too promptly, too soon or too effectually. A baker's dozen of leading railroad men can do this any day they choose to do so.

PLAIN SPEECH.

#### Welding Steel Scrap.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I notice in the number of the *Railroad Gazette* dated March 31 ult., among the news under the heading "Scrap Heap," an item said to be copied from the *Detroit Post*, describing "A

new process for rolling steel-headed rails" now in use at the Wyandotte Rolling Mills, which, briefly stated, claims the using of scraps of steel, hitherto not utilized, to form, in whole or part, the head of the rail; said scraps of steel being spread the required thickness upon the iron base, and by the use of a flux (the component parts of which are specified in said item) the whole mass is heated and rolled in the ordinary manner and found to be so perfectly solid and homogeneous as to resist all efforts to separate in the least degree the two different metals, viz., the iron base and steel top.

From the item here mentioned your readers would naturally infer that such process, or rather discovery of this valuable flux and its use originated at the Wyandotte Rolling Mills.

I beg leave, therefore, to state that I have been using the flux constantly for the past three years in the blacksmith shop of the Delaware, Lackawanna & Western Railroad Company, Bloomsburg Division, at Kingston, Pa., of which shop I am foreman, and I hold a patent on this flux which fully covers the welding in any manner of steel to steel or iron to steel.

For the past 16 months we have been making all the heel plates for frogs used on the Bloomsburg Division, with steel tops ½ in. thick on iron base same thickness; are making constantly machine tools, cutters, drills, etc., for machine shop, rock drills, track and quarry tools, and all made from waste or scrap pieces of steel practically valueless, except for this process, only as scrap.

Our mode of using the scrap is to fagot it into blooms, and draw it out under steam hammer into bars of the most suitable forms and thicknesses for the purposes required.

Everything that we have made so far has given as perfect satisfaction as the best cast steel generally used for such purposes, and at a very great saving as regards the cost.

In justice therefore to myself, I ask you to favor me by inserting this in your paper.

DAVID MILES.

KINGSTON, Pa., May 2, 1876.

#### Economy of Steam in Locomotives.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In the number of your paper of April 21, "Expert" says, in relation to a Bureau of Experimental Research, that after many years of experiments he is satisfied beyond a doubt that a very large percentage of the steam power in the present locomotive is wasted and thrown away. Now I, for one, would be much pleased to have the writer give me some light on this subject. I am nearly of his opinion, that many of our little old-fashioned locomotives did more work, for their size and *heft*, with the steam they carried, than our present locomotives are doing. I would like to hear from the writer again on this subject; and in the case of the little old engine, was she link motion or hook, lap-valve or cut-off? If a hook motion, what build? Wishing to see a reply from "Expert," I am,

H. KINGSLAND, L. E.

#### TRAFFIC AND EARNINGS.

##### Coal Movement.

Coal tonnages are reported as follows for the four months ending April 29:

Anthracite:	1876.	1875.	Inc. or Dec.	P. c.
Delaware & Hudson Canal Co.	597,048	905,019	Dec. 307,971	34.0
Delaware, Lack. & Western.	398,518	829,870	Dec. 431,352	52.0
Pennsylvania Coal Co.	285,109	358,472	Dec. 73,363	20.2
Lehigh Div., Central of N. J.	593,305	101,736	Inc. 491,569	483.2
Lehigh Valley.	904,495	425,626	Inc. 478,869	112.6
Philadelphia & Reading.	990,355	332,831	Inc. 657,524	197.6
Northern Cen., from Shamokin Division and Summit Branch.	190,049	281,120	Dec. 151,071	53.7
Scranton, Hazleton & Wilkes-Barre.	11,910	11,511	Inc. 399	3.5
Pennsylvania & New York.	8,412	21,760	Dec. 13,348	61.2
State Line & Sullivan.	14,724	5,355	Inc. 9,369	175.0
Pennsylvania Canal.	30,570	.....	Inc. 30,570	.....
Total anthracite.	3,965,555	9,273,300	Inc. 5,307,745	21.1
Semi-bituminous:				
Huntingdon & Broad Top.	91,761	121,324	Dec. 29,563	24.4
East Broad Top.	22,946	11,040	Inc. 11,906	107.8
Belleville & Snow Shoe.	18,123	.....	.....	.....
Tyrone & Clearfield.	309,773	266,445	Inc. 103,327	38.8
Cumberland, all lines.	393,189	506,288	Dec. 113,099	23.2
Total semi-bituminous.	695,791	.....	.....	.....
Bituminous:				
Barclay R. R.	113,680	91,952	Inc. 21,728	23.6
Allegheny Region, Pa. R. R.	64,615	61,068	Inc. 3,547	4.8
Pittsburgh.	97,949	.....	.....	.....
Penn. and Westmoreland gas coal.	211,644	269,242	Inc. 57,598	32.6
West Pennsylvania R. R.	69,375	.....	.....	.....
Southwest Pa. R. R.	17,728	.....	.....	.....
Total bituminous.	574,991	452,562	Inc. 122,429	27.0
Coke:				
West Pennsylvania R. R.	14,743	.....	.....	.....
Southwest Pennsylvania R. R.	140,902	.....	.....	.....
Penn. and Westmoreland.	10,412	.....	.....	.....
Pittsburgh Region, Pa. R. R.	80,015	.....	.....	.....
Total coke.	232,072	204,427	Inc. 27,645	13.5

The disturbances in the Cumberland region as to the rates of miners' wages still continue and help to diminish the product. The trouble over the transportation question is not likely to be settled for some time. Meantime the Clearfield region is profiting, as is shown by the great increase of shipments. The anthracite shipments show some sharp contrasts with a general gain.

The coal shipped from the mines on the South & North Alabama road for the nine months ending March 31, was as follows:

Tons.	1875-76.	1874-75.	1873-74.
	97,690	15,540	4,510

This is only the tonnage originating on the line of the road, and does not include coal received from the Alabama & Chattanooga road.

##### Chicago Live Stock Traffic.

Receipts and shipments in April were:

	Receipts.	Shipments.
Cattle.	97,976	88,717
Hogs.	225,602	94,026
Sheep.	20,386	20,421

Of the cattle receipts, 35 per cent. was by the Chicago, Burlington & Quincy road, 23 per cent. by the Rock Island, 14 per cent. by the Northwestern, 10.9 per cent. by the Illinois Central and 10.8 per cent. by the Chicago & Alton. Of the shipments,

30½ per cent. were by the Lake Shore road, 30½ per cent. by the Michigan Central, 25 per cent. by the Fort Wayne and 7½ per cent. by the Baltimore & Ohio.

##### Railroad Earnings.

Earnings for various periods are reported as follows:

Year ending Dec. 31:

	1875.	1874.	Inc. or Dec.	P. c.
Greenville & Columbia.	\$536,192	\$501,934	Dec. \$34,258	9.4
Expenses.	294,906	321,489	Dec. 26,583	8.3
Net earnings.	\$241,286	\$270,445	Dec. \$29,159	10.8
Earnings per mile.	3,269	3,609	Dec. 340	9.4
Per cent. of expenses.	55.00	54.31	Inc. .69	1.3
Hamilton & Northwest-ern, Lake Erie Div.	78,893	.....	.....	.....
Expenses.	49,078	.....	.....	.....
Net earnings.	\$29,815	.....	.....	.....
Earnings per mile.	2,465	.....	.....	.....
Per cent. of expenses.	62.20	.....	.....	.....

Four months ending April 30:

	1876.	1875.	Inc. or Dec.	P. c.
Atchison, Topeka & Santa Fe.	\$638,549	\$363,595	Inc. \$274,954	75.3
Canada Southern.	598,785	318,804	Inc. 279,981	87.8
Central Pacific.	4,562,900	4,373,344	Inc. 189,556	4.3
Chicago & Alton.	1,361,505	1,379,729	Dec. 18,224	1.3
Chicago, Milwaukee & St. Paul.	2,263,332	1,931,808	Inc. 331,524	17.2
Illinois Central.	2,348,148	2,278,090	Inc. 70,058	3.0
Ind., Bloom. & West.	509,856	425,555	Inc. 84,301	19.8
Michigan Central.	2,260,915	2,153,892	Inc. 107,023	5.0
Missouri, Kan. & Texas.	971,784	820,480	Inc. 151,304	18.3
Ohio & Mississippi.	1,229,853	1,074,321	Inc. 155,532	14.5
Pacific of Missouri.	1,185,956	951,388	Inc. 234,568	24.4
St. Louis, Alton & Terre Haute, Belleville Line	157,974	202,732	Dec. 44,758	22.1
St. Louis, Iron Mountain & Southern.	1,210,057	1,083,963	Inc. 126,094	12.5
St. Louis, Kansas City & Northern.	1,034,210	868,926	Inc. 165,284	19.0
Tol., Peoria & Warsaw.	432,228	280,860	Inc. 151,368	53.9

Three months ending March 31:

	1876.	1875.	Inc. or Dec.	P. c.
Bur., Cedar Rapids & Minn.	\$299,469	\$262,494	Inc. \$36,965	14.1
Expenses.	205,928	192,300	Inc. 13,628	7.1
Net earnings.	\$93,541	\$70,194	Inc. \$23,347	34.0
Per cent. of expenses.	68.76	73.25	Dec. 4.49	6.1
Chl., Burl. & Quincy.	2,644,338	2,546,031	Inc. 98,307	3.9
Expenses.	1,379,412	1,449,770	Dec. 70,358	4.0
Net earnings.	\$1,264,926	\$1,096,261	Inc. \$168,665	15.4
Per cent. of expenses.	52.17	56.94	Dec. 4.77	8.4
Cleve., Mt. Vernon & Delaware.	84,591	96,312	Dec. 1,721	2.0
Expenses.	69,782	79,810	Dec. 10,028	8.5
Net earnings.	\$14,809	\$16,502	Inc. \$1,693	10.8
Per cent. of expenses.	62.48	65.53	Dec. 3.05	3.6
Mo., Kan. & Texas.	756,996	728,009	Inc. 128,987	20.5
Expenses.	372,498	319,687	Inc. 52,811	16.2

	1876.	1875.	Inc. or Dec.	P. c.
Net earnings.	\$384,498	\$308,322	Inc. \$76,176	24.7
Per cent. of expenses.	49.21	50.91	Dec. 1.70	3.3
Paducah & Memphis.	59,765	47,121	Inc. 12,644	26.8
Expenses.	37,292	37,063	Inc. 229	0.6
Net earnings.	\$22,473	\$10,058	Inc. \$12,415	122.9
Per cent. of expenses.	62.36	78.48	Dec. 16.12	20.5
St. Louis & Southeast.	249,821	254,023	Dec. 4,202	1.6
Expenses.	217,579	221,658	Dec. 4,079	1.8

	1876.	1875.	Inc. or Dec.	P. c.
Net earnings.	\$32,242	\$32,865	Dec. \$623	0.2
Per cent. of expenses.	87.10	87.09	.....	.....
St. Louis, Iron Mountain & Southern.	935,510	808,611	Inc. 126,899	15.7
Expenses.	483,293	478,680	Inc. 4,613	1.0

	1876.	1875.	Inc. or Dec.	P. c.
Net earnings.	\$452,217	\$329,931	Inc. \$122,286	37.1
Per cent. of expenses.	51.66	59.20	Dec. 7.54	12.7
St. Louis, Kansas City & Northern.	800,206	648,234	Inc. 151,974	23.4
Expenses.	422,021	.....	.....	.....

	1876.	1875.	Inc. or Dec.	P. c.
Net earnings.	\$378,187	.....	.....	.....
Per cent. of expenses.	62.74	.....	.....	.....

Month of March:

	1876.	1875.	Inc. or Dec.	P. c.
Chl., Burl. & Quincy.	\$885,753	\$920,923	Dec. \$35,170	3.8
Cleve., Mt. Vernon & Delaware.	29,608	35,051	Dec. 5,443	15.5
Michigan Central.	589,992	611,211	Dec. 21,219	4.4
Expenses.	388,180	458,377	Dec. 70,197	16.3

	1876.	1875.	Inc. or Dec.	P. c.
Net earnings.	\$105,802	\$182,834	Inc. \$77,032	28.1
Per cent. of expenses.	66.47	75.00	Dec. 8.53	11.4
Paducah & Memphis.	16,932	16,938	Dec. 6	.....
Rome, Watertown & Ogdensburg.	98,040	.....	.....	.....
Expenses.	60,059	.....	.....	.....

	1876.	1875.	Inc. or Dec.	P. c.
Net earnings.	\$31,981	.....	.....	.....
Per cent. of expenses.	67.41	.....	.....	.....
Toronto, Grey & Bruce.	27,719	\$17,106	Inc. \$10,613	62.4

Month of April:

	1876.	1875.	Inc. or Dec.	P. c.
Atchison, Topeka & Santa Fe.	\$197,000	\$112,474	Inc. \$84,526	75.1
Canada Southern.	168,482	106,755	Inc. 61,727	57.9
Central Pacific.	1,468,000	1,366,984	Inc. 101,016	7.4
Chicago & Alton.	355,530	367,985	Dec. 12,455	5.9

	1876.	1875.	Inc. or Dec.	P. c.
St. Paul.	659,944	639,659	Inc. 20,285	3.2
Illinois Central.	546,081	610,459	Dec. 64,378	10.5
Ind., Bloom. & West.	130,380	102,876	Inc. 27,504	26.7
Michigan Central.	610,543	600,066	Inc. 10,477	1.7
Mo., Kan. & Texas.	214,788	192,471	Inc. 22,317	11.6
Ohio & Mississippi.	306,637	273,441	Inc. 33,196	12.1
Pacific of Missouri.	289,732	263,737	Inc. 25,995	11.8

	1876.	1875.	Inc. or Dec.	P. c.
St. Louis, Alton & Terre Haute, Belleville Line	37,701	40,446	Dec. 2,745	6.9
St. Louis, Iron Mountain & Southern.	288,547	275,382	Inc. 13,165	3.0
St. Louis, Kan. City & Northern.	234,002	220,692	Inc. 13,310	6.0
Toledo, Peoria & War.	118,043	74,809	Inc. 43,234	57.8

Two weeks ending April 15:

	1876.	1875.	Inc
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unfavorable feature of the route is the transfer from boat to car at Huntington, and, in many cases, a transfer from car to boat at Pittsburgh.

#### Flour and Grain Movement.

For the four months from Jan. 1 to April 29 receipts and shipments are reported as follows (flour in barrels and grain in bushels):

Flour:	1876.	1875.	Inc. or Dec.	P. c.	
Lake ports' receipts.....	1,589,202	1,325,426	Inc..	262,776	19.9
" " shipments.....	1,729,225	1,467,474	Inc..	261,751	17.6
Atlantic ports' receipts...	2,822,584	2,803,585	Inc..	18,999	6.2
Wheat:					
Lake ports' receipts.....	10,840,820	12,343,058	Dec..	1,502,238	12.2
" " shipments.....	7,400,141	5,091,138	Inc..	2,309,003	45.4
Atlantic ports' receipts...	7,217,075	6,875,748	Inc..	341,327	9.8
Corn:					
Lake ports' receipts.....	19,092,576	14,682,764	Inc..	4,409,812	30.0
" " shipments.....	15,152,768	7,505,070	Inc..	7,647,698	101.8
Atlantic ports' receipts...	22,137,364	16,875,077	Inc..	5,262,287	29.8
Grain of All Kinds:					
Lake ports' receipts.....	38,905,049	34,252,426	Inc..	4,652,623	11.8
" " shipments.....	27,461,337	16,613,822	Inc..	10,847,515	65.3
Atlantic ports' receipts...	36,128,277	29,680,252	Inc..	6,448,025	21.7

#### Railroad Traffic.

A statement prepared by Col. Flagler, Commandant of the Rock Island Arsenal, shows that during the two years and four months from Jan. 1, 1874, to April 30, 1876, there crossed the

By the lake and canal route from Chicago or Milwaukee to New York, at the latest rates, it costs 11 cents to carry a bushel of wheat, plus the Buffalo elevator charge. Meanwhile the railroads carry for 12 cents without transfer.

#### Ocean Freights.

Rates are higher. Charters from New York are reported as follows: By steam to Liverpool: cotton,  $\frac{1}{4}$  d. per pound; grain, 7d. to  $\frac{7}{8}$  d. per bushel; bacon 35s., cheese 40s. and leather at 60s. per ton. London by sail: wheat  $\frac{7}{8}$  d. per bushel. Petroleum by sail was taken for the United Kingdom and for Cronstadt at 4s. 3d. per barrel.

#### East-bound Rates.

The ruling rate on large shipments of grain from Chicago to New York for the past week continued to be 20 cents per 100 lbs., and the shipments were sufficient to tax the rolling stock of the roads. To Boston the rate is reported at 25, to Philadelphia 22, and to Baltimore 20, though it is probable that these rates are not insisted upon.

#### Standard Rail Section and Fish Plate used on the Pittsburgh, Cincinnati & St. Louis Railway.

We give herewith another engraving of a standard rail section and fish plate used on one of our principal railroads. Their general form resembles that used on the Pennsylvania and Erie

Arrangements will be made for visiting the Centennial Exhibition from this city.

We trust that you will spare no effort to meet with us at the time named.

Yours, truly, C. A. SMITH, Secretary.

Committee of Arrangements:

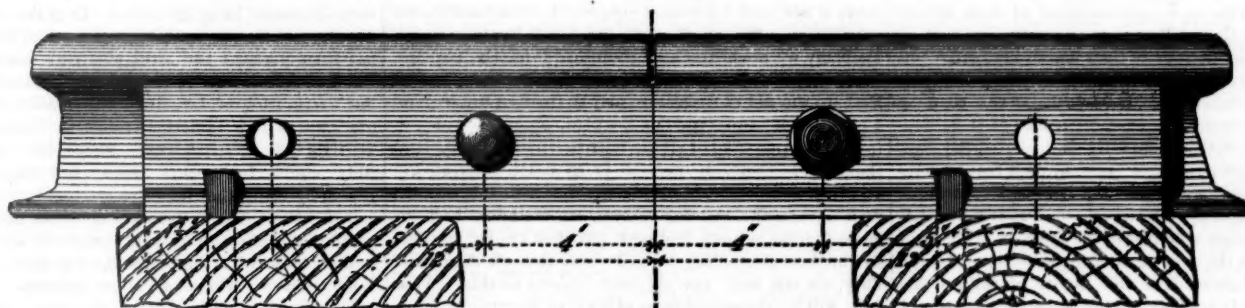
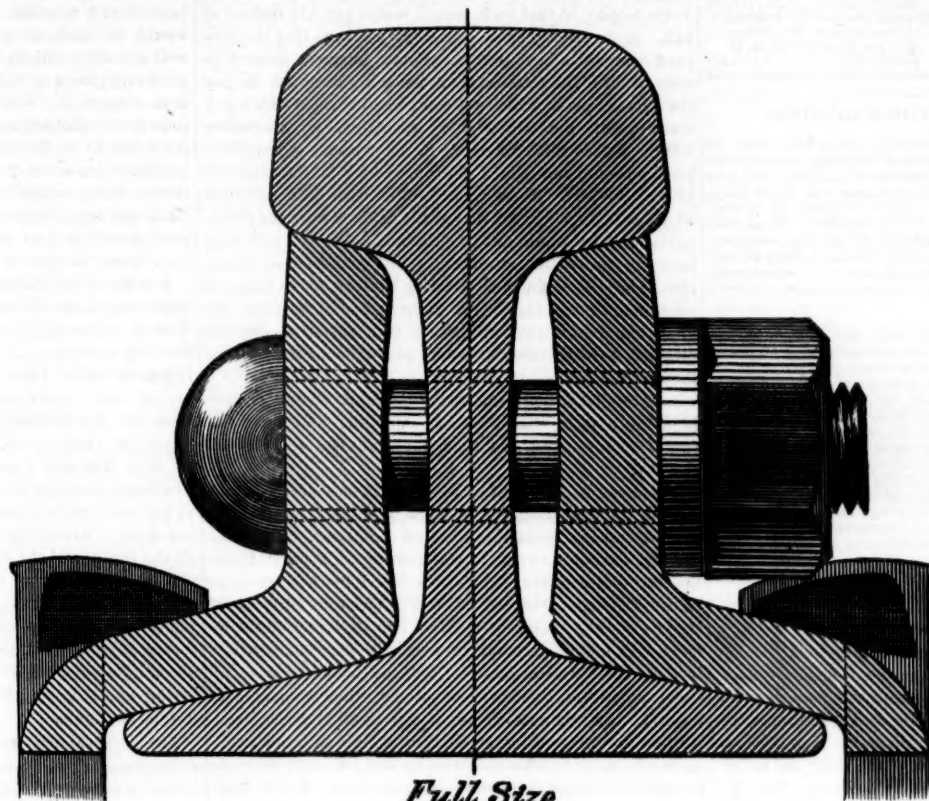
C. A. SMITH, Chairman,  
No. 113 Liberty street, New York.

WILLIS DAVIS,  
Empire Transportation Co., Elizabeth, N. J.

#### THE SCRAP HEAP.

#### The Cambria Iron Works at the Centennial.

The Altoona (Pa.) Sun of April 29 says: "The pyramid of the Cambria Works, of Johnstown, was shipped to the Centennial grounds on Wednesday. This immense structure is composed of transverse sections of rails manufactured at these works, one-half being steel, the other iron. The extreme length at the base is 33 feet; in width it is 10 feet; in height, to the top of the entablature, 16 feet, and to the top of the four twisted rails erected at the four corners of the entablature, 44 feet. The rails exhibit between 50 and 60 patterns, and in weight embrace from the lightest, weighing 15 pounds to the yard, to the heaviest, weighing 83 pounds to the yard. In erecting the pyramid the rail sections are laid transversely, with three tiers to each layer. From the base to the entablature they are contracted 12 inches at each tier, and as the



Inside Bar

Scale 3 in's = 1 foot

Outside Bar

STANDARD RAIL SECTION AND JOINT SPLICE: Pittsburgh, Cincinnati & St. Louis Railway.

bridge over the Mississippi between Rock Island and Davenport 13,833 engines, 21,651 passenger cars, 288,430 freight cars, 439,244 teams and 8,294,761 foot passengers. During the same time there passed through the draw on the river 3,708 steamers, 1,176 barges and 1,236 rafts.

#### Freight Rates to Missouri River Points.

At a meeting held in St. Louis last week, all the lines interested being represented, the following rates were agreed upon to Kansas City, St. Joseph, Leavenworth and Atchison:

	From Chicago.	From St. Louis.
First class, per 100 lbs.....	\$0.85	\$0.85
Second " " .....	0.70	0.50
Third " " .....	0.45	0.35
Fourth " " .....	0.30	0.25
Special " " .....	0.25	0.20
Salt, cement and plaster in car-loads, per bbl.....	0.65	0.35
Class A, per car-load.....	75.00	50.00
Class B, " .....	60.00	40.00
Class C, " .....	40.00	30.00
Lumber " .....	62.50	32.50

East-bound rates are made arbitrary to St. Louis. Missouri lines will not accept less on freight going to Eastern markets than on that consigned to St. Louis proper.

#### Lake Rates.

Charters were reported May 3 at Chicago at 3 $\frac{1}{2}$  cents and 4 cents for wheat by sail to Buffalo, 7 $\frac{1}{2}$  cents to Kingston; at Milwaukee, 7 $\frac{1}{2}$  cents for wheat by sail to Oswego. Since that time charters are reported as follows:

Chicago to Buffalo, 3 $\frac{1}{2}$  cents per bushel for wheat, 2 $\frac{1}{2}$  for oats, 3 $\frac{1}{2}$  for corn. Wheat from Milwaukee, 4 cents to Port Colborne, 11 to Montreal. Buffalo to Chicago, 25 cents offered for coal.

roads, although they differ somewhat from them in their proportions. In establishing a standard section of this kind it is, we think, important that all the construction lines—that is, the radii and centres of curves—and the dimensions should be given. If they are not, the standard is liable to vary, owing to inaccuracy in drawing and shrinkage of paper; whereas if all the construction lines and dimensions are given, the forms can be reproduced with entire accuracy at any time. The general form of the rail and fish plates approximates very closely to what now seems to be the most approved practice.

The washer shown under the nut is what is known as the "Verona nut lock," which, the Superintendent of the road says, "seems to answer all the purposes for which it is intended."

#### Master Car Builders' Convention.

The Committee of Arrangements has issued the following circular to members:

The tenth annual meeting of the Master Car Builders' Association will be held in the city of New York, June 14, 15 and 16, 1876.

The Committee of Arrangements have selected the Grand Central Hotel as the headquarters of the Association, and have made favorable arrangements with the proprietor for the entertainment of members. Price per day, \$3.50.

Persons wishing to engage rooms will communicate with the proprietor, Mr. H. L. Powers, stating the number of persons for whom accommodations are desired.

height of each will average about the same there are offsets, or steps, which are seven in number at each end. These offsets will be arranged as follows: The first in the order which is most appropriate we may designate as the one nearest the entablature, and will contain specimens of coal; the second, coke; the third, limestone and fluxes; the fourth, ores; the fifth, pig irons; the sixth, spiegel, made by the Cambria Iron Company; and the seventh, next the platform, will contain specimens of the finished product. This is the arrangement on the end of the pyramid appropriated to steel, and the opposite end will be similar, with the exception that puddled furnace balls and puddled blooms will take the place of spiegel. Thus, it will be observed, that at a single glance the curious in such matters can note the various stages of manufacture, from the raw material that enters into the composition of iron until the perfect rail or bar is turned out.

"The iron and steel used in constructing the pyramid were not manufactured for that purpose, but taken from the ordinary run of the mill.

"A primitive rail, which did duty in its time on the old Portage Railroad, fastened in a stone which was used on the same road, will be among the collection."

#### Too Much Alike.

A Connecticut express agent gives the following account of his experience in a recent railroad disaster: "I was pitched against the safe. I scrambled up with the other fellows, and then I missed something and exclaimed, 'All is lost!' 'What's lost?' inquired the brakeman. 'Why my ear.' I always thought that I should lose one of 'em some day.' Then I looked up and saw it hanging from a hook where my head was plunged, and then I reached out and unhung it; and it wasn't my ear, but my canvas express bag."





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## Editorial Announcements.

**Advertisements.**—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns our own opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

**Contributions.**—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery, and in their management, particularly as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

## LEGISLATION AGAINST DISCRIMINATIONS.

In reply to some remarks of ours on a previous letter, a correspondent, over the signature "Plain Speech," makes sweeping charges against American railroad management, and especially Western railroad management, and apparently justifies any attempt at regulating it by law on the ground that nothing could make it worse. It is, perhaps, not worth while to say anything as to his charge of universal neglect of, and contempt for, the rights of the community by railroad managers. We happen to know certain managers of Iowa railroads whom we should class with the most conscientious of men, earnest in the service of their fellow-men generally, as well as devoted to the just interests of their employers, and laboring with scarcely surmountable zeal, industry and energy to do their work in such a way as to promote the common good. So far has one of the most influential of them supported the rights of the community and asserted the limitation of the proper powers of the railroads that we have heard him called a "Granger." But it is useless to argue this matter. "Plain Speech" asserts that railroad managers pay no attention whatever to the just requirements and complaints of the customers of their roads; and those of them who have given days and nights of toil to this duty—as it certainly is a duty—are doubtless so accustomed to expressions of this kind—made often enough by honest men who have not been able to see why the railroad company could not grant what they asked of it—that they take them as one of the disagreeable incidents of their occupation. However, whether railroad managers have had any consideration for the public or not, somehow their labors have been immensely for the public advantage and in a much less degree for the profit of railroad proprietors. In their hands—stupid, dishonest and grasping as "Plain Speech" thinks them—the cost of transportation has gone down, down, down with a rapidity unequalled in any other important service, and for the most part the community and not the railroad owners have received the benefit of the reduction. This is an indubitable fact, which cannot be gainsayed. Millions of people who not many years ago paid an average of 2½ cents per ton per mile for transportation, now get it done for 1½ cents or less. Railroad companies which paid out 1½ cents per ton per mile for expenses and received a cent of profit, having now reduced expenses to a cent per ton per mile, receive, not a cent and a half, but only half a cent profit—some of them much less.

"Plain Speech" re-affirms that the discriminations specified in his previous letter were sufficient grounds for a law prohibiting such discriminations. We, on the other hand, re-affirm that no degree of discrimination is of itself evidence either that the discrimination is unjust

or that it is injurious to the community against which it is made. As we said before, a discrimination may be grossly unjust and may be fatal to important interests. But this is not proved by the degree of discrimination; and a discrimination may prevent certain industries or destroy certain branches of business, and yet be of public utility. Generally, in railroad transportation, it is for the advantage of all the old customers of the road that it should get new customers, provided their business yields it any profit, however small. If a railroad is built across Iowa and supported entirely by Iowa traffic, the interest on its cost must be paid, if paid at all, by the Iowa customers. Let us say there are 200,000 of these who pay the railroad company on the average \$15 a year each for transportation, \$2,000,000 of the total going for working expenses and \$1,000,000 for interest on the capital invested. If now 50,000 people in Nebraska will use the road, if they can have done for \$12 what the Iowa people pay \$15 for, if their traffic is accepted a profit of \$100,000 will be made on it, and this will make it possible to reduce by a tenth the profit paid by the Iowa people, so that each person would pay \$14 instead of \$15. It is exactly such questions as these that the railroad companies have to face. Some business cannot be done at all if the rates on it are made high enough to pay the average profit which yet can be had at rates which pay some profit. Sometimes there are natural circumstances which make this difference in the capacity of freight to yield a profit; sometimes the only cause is the competition of carriers. The former applies usually to products so distant from market that at the average rates for transportation they would not be cultivated, and to materials heavy in proportion to their value, such as coal, stone, etc. The latter finds a striking illustration in through west-bound rates, which on many valuable articles are much less than the average cost of transportation, though probably hardly a ton less would be carried at three times those rates.

And this leads us to another complaint of our correspondent, namely, that rates are sometimes and on some traffic much too low, and that important interests suffer thereby.

There can be no doubt of this. It is one of the great evils of the transportation business as it is actually conducted, and is a legitimate cause of complaint. But, conceding the evil, what is the remedy? Does "Plain Speech" suppose that this is occasioned by the caprice of railroad managers; or that railroad proprietors deliberately throw away the chance of making two dollars instead of one? An inevitable result of perfectly free competition is that great discriminations will be made because of this competition, besides those others which we may call natural. If our correspondent can provide a practical method for preventing such results, the railroad managers whom he berates will rise up and call him blessed, in spite of his back-handed compliments. So far, they must confess, the problem has been too hard for them. Time and again have they sought to solve it, and of late years it has been a foremost subject of consideration and negotiation. We know what the result has been so far. Probably we are nearer a solution than formerly, perhaps, even, very near it. Will legislation hasten the process? Perhaps the aid of legislation may be invoked to carry out a plan, but it cannot provide the plan, except by providing for the purchase of all the railroads by the State. How should it? Certainly no one is so much interested in avoiding competitive contests as the railroad owners; their agents, the railroad officers, are certainly best informed on the subject, and best qualified to plan an effective method of avoiding the evil which they all deprecate. They, we see, have not yet been able to do this. Who, then, will? The assemblages of lawyers, merchants, farmers, etc., who make up our legislatures and Congress—men who have a hundred other things to investigate and their private business to attend to? They may legislate, it is true, as they do; but they cannot legislate effectively without knowledge, and this they have not and cannot get without resorting to these very railroad officers who have repeatedly tried and failed.

Our correspondent says that the owners of railroads do not properly care for them. Suppose this to be true, how can they be cared for better? Men do not properly care for their lives and health and property, and yet each sane adult individual takes infinitely better care of himself than any legislature could. In the nature of things no one is and no one can be so much interested in taking care of the railroads as the people who own them. They may do badly, but the whole history of man shows that any one else would do worse. It is true that the railroads and other properties representing great aggregations of capital owned by a large number of persons are not, on the average, managed as faithfully and economically as properties owned by single individuals or small firms, for reasons easy to understand. If "Plain Speech" had a capital of \$45,000, of which \$40,000 was invested in his private business and \$5,000 in three or four different railroads, he would probably give nearly all his time to his private business, and hardly give any of it to observing the conduct of the managers

of the railroads in which he was interested; that is, he would not subject his employee the railroad manager to anything like the severity of inspection which he properly gives to his employee the head clerk or bookkeeper of his private business. Even if he did, it would be less effective, because of his want of a thorough knowledge of the details of railroad business. Now railroads are owned, for the most part, by people who have most of their capital and nearly all their attention and ability absorbed by other business. Consequently mismanagement, waste and fraud are less readily detected and prevented in the railroad business. By the system and division of labor only possible in such great enterprises, great savings are made; but these must be set off by the losses incident to the nature of the proprietary. This is one of the oldest experiences of the civilized world, though it is comparatively new in industrial enterprises. But a government has always been an organization including all the individuals of an entire nation, in whose good management and economical conduct of its business all are interested; and yet nowhere has it yet been found possible to organize a government which would do work as well as an individual, very rarely as well as a corporation. We have ceased to expect it, and we rarely give a government any work to do which can be done without it. Some things cannot be done without it, such as the maintenance and conduct of armies; and others it can do on the whole economically (in some countries at least) because of its possessing an organized administrative force which more than makes up by division of labor and united resources for the waste, negligence, corruption and lack of the earnestness caused by want of a large direct interest in the result.

The use of the Michigan Central as an illustration of mismanagement is not altogether fortunate. The President of this company was, so far as our observation goes, the very first man in the country to call attention to the injurious effect likely to be caused by the great number of new railroads, and he recommended some at least of his company's leases, as the choice of the least of two evils. Moreover, but a small part of this company's misfortunes is due to these leases. The losses on their account last year were equal to only 2½ per cent. on the stock; but a reduction of more than 40 per cent. in the average freight rate very easily took away all the rest of the old 10 per cent. dividend. It does not need mismanagement to destroy profits when the average amount of profit on freight falls off nearly one-half in five years. We do not purpose to defend the management of this or any other company; but it will, perhaps, be fair to set off a loss of \$430,000 through unprofitable leases by a saving effected (or somehow occurring) of \$1,500,000 in freight expenses.

Although such a discrimination as that to which Iowa river towns are subjected may injure the business of these towns, it is questionable whether the public, and the Iowa public especially, does not profit by it. This is only one of the forces which, in free competition, tends to concentrate business in great cities. It is the endeavor to escape from them—to make big cities out of little ones—that has been perhaps the most powerful motor in causing the late great over-production of railroads. In Iowa the river towns wished to rival Chicago, and the towns at interior railroad crossings wished to rival the river towns. They did all they possibly could to secure each to itself a railroad system by which they might receive produce and distribute merchandise. The railroads were built, and then it was found that there were too many railroads for the business. In the competition that ensued, only those railroads and those towns where a large business was concentrated came off well, and they were injured by the presence of their superfluous and suffering competitors. The railroads, too, increased the number of competitive points, so that places formerly charged local rates alike from Chicago and the nearest river town now have competitive through rates from one of the two, and most frequently from the larger, in which case the river towns find it more difficult than ever to compete with Chicago for the trade of those places. This is a natural result of events in which, for the most part, railroad managers had little opportunity to exercise discretion. They maintained local rates as long as they could, and reduced them so that they pay less than their share of profit when their alternative was the loss of all the traffic of those places and all the profit on it.

## Some Effects of Reductions in Rates.

The railroads have now been carrying grain from the Northwest to the seaboard at greatly reduced rates for about three weeks. Much has been thought and said (especially by investors) as to the effect of this policy on the earnings of the railroads; but we may also study with profit its effect on their traffic and the business of their customers.

As illustrating the effect of the low rates on grain shipments, we may quote the following statement of the com-



parative amounts shipped from Chicago during the week ending May 6, navigation being just open both years:

	1876.	1875.	Increase.	P. c.
Bushels shipped.....	2,162,095	1,404,320	757,775	53.9

This increase is in spite of the fact that in 1875 lake rates were very low, and a railroad war was prevailing which brought east-bound rail rates very low, though not so low as they are now.

The stimulating effect on shipments is perhaps shown better by a comparison of the amounts, given below, shipped by rail from the eight chief Northwestern markets (Chicago, Milwaukee, Detroit, Toledo, Cleveland, St. Louis and Peoria) for each of six weeks:

Rail Shipments of Grain from the Northwest for Six Weeks.

Week ending—	
March 25.....	1,004,057 bushels.
April 1.....	1,250,759 "
" 8.....	1,640,133 "
" 15.....	1,925,097 "
" 22.....	2,867,642 "
" 29.....	3,707,487 "

The regular rate on grain from Chicago to New York was 40 cents down to April 13, when it was made 35 cents. It was reduced to 30 cents April 21, but not maintained at that rate for a single day, contracts being made at 25 cents on the 22d, we believe, which seems to have been the most unusual rate until after the 24th, when shipments were made at lower rates; and since that time 20 cents per hundred seems to have been the ruling rate.

The increase in receipts at Northwestern markets, though not equally great, is still marked; and this notwithstanding the fact that these receipts mainly come from the farmers directly, and that at this season they are so engaged in the spring work of plowing and planting that it is not easy for them to find time to haul their grain to market, even if the roads permit. The condition of the roads, however, was probably worse in the earlier than in the later weeks. It has been so bad much of the winter and earlier spring as to make the hauling of loads impracticable in many districts.

The receipts at the eight Northwestern grain markets for six weeks of this year were:

Northwestern Grain Receipts for Six Weeks:

Week ending—	
March 25.....	1,567,750 bushels.
April 1.....	1,838,415 "
" 8.....	1,896,720 "
" 15.....	1,910,469 "
" 22.....	2,009,581 "
" 29.....	3,210,437 "

Thus the receipts of these markets have doubled and their shipments nearly quadrupled within six weeks.

The increase in receipts and shipments is common at this period of the year, the cause being usually the near approach of the opening of navigation. This is illustrated by the following comparison of Chicago grain receipts for five weeks of three years:

Chicago Grain Receipts for Five Weeks.

Week ending—	1876.	1875.	1872.
April 1.....	513,087	789,172	326,325
" 8.....	518,098	459,788	549,559
" 15.....	536,916	1,285,812	823,520
" 22.....	1,013,685	1,872,210	799,783
May 6.....	1,422,978	1,445,501	975,517

Last year, reductions in rail rates had an influence somewhat similar to that operating this year; but if we go back to 1872, we see that Chicago receipts were then about three times as great in the first week of May as in the last week of March. The chief effect of the low rates, then, is not so much an increase in grain movement, either to or from the lake ports, as a diversion of the shipments of lake ports from the lakes to the railroads. Our figures for shipments, it must be remembered (except for one week from Chicago), are for rail shipments only.

In the long run, we could not expect this to be otherwise. The Northwest will be sure to ship pretty much all its surplus grain before fall whether rates are as they are or twice as high; and consumers will use very little more this season because the price is low. To occasion an effect on the amount produced or consumed it would be necessary that reduced rates should be maintained for a year, or two or three years.

Another question of interest is, who gets the advantage of the reduction of rates, the producer or the consumer. An investigation of the course of prices at New York before and after the reduction will indicate the answer to this question.

Prices of Wheat and Corn in New York.

	Wheat.	Corn.
Day.	No. 2 Spring.	Western Mixed.
March 24.....	\$1.23 to \$1.31	\$0.63 to \$0.65½
" 31.....	1.24 " 1.30	0.63 " 0.65½
April 7.....	1.22 " 1.28	0.69 " 0.70
" 14.....	1.22 " 1.28	0.71 " 0.73
" 21.....	1.22 " 1.27	0.66 " 0.69
" 28.....	1.17 " 1.22	0.60 " 0.66
" 5.....	1.16 " 1.21	0.59 " 0.63
May 10.....	1.11 " 1.20	0.56½ " 0.62½

This shows a decrease since the low rates have prevailed of 11 cents in the lowest and 8 cents in the highest quotations for wheat, and 14½ cents in the lowest and 10½ in the highest quotation for corn. Meanwhile the reduction in the price of transportation to New York has been 11½ to 12 cents. Thus the benefit of the low rates seems to have been reaped almost exclusively by the consumer; very little, or not at all by the producer. It is perhaps quite as desirable that the consumer should be benefited as the producer; but it is interesting to observe that while the chief pressure for reducing the cost of transportation comes from the producers of grain, and no fault is found

by consumers, now that the reduction is made, the latter and not the former get the benefit of it.

# THE UNITED STATES INTERNATIONAL EXHIBITION.

## I.

The inexorable almanacs and other conspiring circumstances have brought us at last to the eve of May 10, 1876, and the celebration of our Centennial anniversary. Its advent is not without somewhat of that momentous character which all great events assume, and coming to visit it is attended with some feeling of solemnity, such as a traveler experiences in approaching Niagara. It is as hard to find adjectives to describe the one as the other, and if called upon to furnish appropriate ones for the Centennial on a very short acquaintance, the writer would hunt up the word *east* in a book of synonyms, and then give all the words which follow, which the reader can do quite as well as the writer. Of the degree of *eastness*, it is only possible for those who have seen other international exhibitions to speak authoritatively. Whether Vienna or Paris was *east* than Philadelphia, probably only the dimensions of the buildings would determine, but to an American who has seen only the exhibition on this side of the water, the Centennial appears *very east*. The general impression produced by a visit of only a few hours, and of observations which were confined a most entirely to the machinery hall, was that the deficiency of the Exhibition would be in the quality and not in the quantity of the articles exhibited. Of course, this judgment may be quite erroneous, and if made final would certainly be premature, because in all the buildings and the grounds chaos still reigns; but it may be called an organic chaos, because below the confusion which prevails, a design is being developed, and daily and hourly grows more apparent.

The first indication of the Exhibition which a traveler from New York observes in entering Philadelphia is a cloud of red dust, if it is a dry day, and mud of a corresponding color on a wet one, as he crosses Girard avenue. The rows of beer shops, with which that and all other approaches to the Exhibition grounds are lined, next appear, and then a glimpse of the flags and towers of the Exhibition buildings appears and disappears as quickly. The regular trains from New York by both routes run into the new depot of the Pennsylvania Railroad, which is still in an unfinished condition, but is in a remarkable state of progress, if the time when it was commenced is taken into consideration. It is located on Market street, a little farther west than the old New York depot, the head house being of brick, and the train shed of wood with a wooden arched roof. We are inclined to believe, however, that serious inconvenience will be experienced by the Pennsylvania Company during the next week or two in disposing of the immense numbers of people who will be likely to throng here during the opening and early days of the Exhibition, owing to the incomplete state of their preparations. Even on the 8th the midday train was overcrowded to an uncomfortable degree, although at that time no extra trains were run, as we believe it is proposed to do hereafter.

With reference to sleeping accommodations, about which some serious apprehensions were had at one time, and are still felt by some persons, it does not now seem probable that there will be much difficulty. The Continental Hotel, it was reported, was full as early as the 8th, and there is no doubt but that first-class hotel accommodations will be difficult to secure, and will be expensive. There is a notable vagueness about the prices which hotel proprietors name, and they are evidently not prepared to commit themselves until they "feel the market;" but if report speaks truly, there will be great numbers of private houses and boarding houses available for lodgings for strangers. As the Master Mechanics' Association have, through their committee, selected the Hotel Aubrey as their headquarters during the convention to be held next week, the writer also selected the same place. It is a new house, or rather a whole block of new houses, in West Philadelphia, which will be converted into private dwellings after the Centennial, for which purpose they were designed and built. They are connected together by a long porch or verandah in front, and there is no communication at all from one house to the other on the inside. The houses, furniture and everything are entirely new. The rooms which will ultimately be the parlors of the dwellings are large, and will accommodate four or more persons, and for those who do not object to a gregarious mode of life, they will be extremely comfortable.

Around the entrance to the Exhibition buildings and grounds there cluster a number of hotels of all classes, some large and expensive, others low in price, morals and manners, so that a stranger within these gates can take his choice. Probably those who incline to quiet tastes and unostentatious but respectable and inexpensive living will be suited best at private or boarding houses, which can be secured with little difficulty, especially if a visitor can obtain the intervention of a resident friend.

Around the entrance to the buildings there is a crowd of people, vehicles, horse-cars, with a mingling of railroad trains and locomotives, engaged now mostly in carrying away empty boxes and the debris of unpacking, although, of course, there are still many goods which are not yet delivered. The crowd which lingers about the entrance seems hardly accustomed to itself, and has a sort of undecided, loitering manner, as though it did not exactly know what to do next. The railroads are laid in the streets in what appear to be the most extraordinary curves, looking like immense flourishes made by gigantic strokes of a pen to ornament the plan of the project. In every quarter beer shops spread their bibulous allurements, and from general indications the numbers of "drunk and disorderly" to be provided for will bear some relation to the magnitude of all the rest of the celebration.

The depot of the Pennsylvania Railroad on the ground is a wooden building of very good design, and the arrangements

for directing passengers to and from their trains appear to be very complete.

Whether the facilities for transportation to and from the Exhibition grounds will be sufficient, is still uncertain. Besides the lines of horse cars, there is a "transfer company, limited," which is running omnibusses from the city to the Exhibition grounds at a fare of 25 cents. The Reading Railroad Company will run trains every ten minutes from the depot, corner of Broad and Callowhill, Ninth and Green streets, and from the North Pennsylvania Railroad depot direct to the grounds. The Pennsylvania Railroad Company will also run trains from the foot of Washington avenue, and small steamboats will run from the Fairmount Water Works to a landing in the Park near the Exhibition buildings.

Tuesday, the 9th of May, was ushered in by a heavy rain storm, which converted the clouds of red dust into masses of red mud, and it became evident to the visitor to the grounds that it would be necessary for the managers to mend their ways very speedily, unless some sort of alliance exists between them and a "black yer boots" company (limited) which may be formed if the present condition of things lasts.

On entering the Machinery Hall through the main entrance, the visitor comes at once into the department devoted to Great Britain and Ireland. Many of the exhibits here are still unpacked, but of those in position, that of Messrs. Saxby & Farmer, the celebrated manufacturers of signaling apparatus, is among the most prominent. They exhibit models of their apparatus with drawings and photographs. The models were most of them covered up, and a portion of them, which were injured by the falling of a steam crane, were being repaired. Messrs. Brierly Bros. also exhibit a model of signaling apparatus, but it was covered, so that its construction could not be seen. Messrs. Greenwood & Battey, of Leeds, England, exhibit a bolt-heading machine and other machinery. Another firm whose name was not taken exhibits some very excellent sugar machinery, consisting of a large beam engine with cylinder 24x54 inches.

Messrs. Appleby Bros., of London, exhibit several steam cranes mounted on iron-framed four-wheeled cars. Mr. B. S. Massey, of Manchester, exhibits steam hammers and a four-headed boring machine, and Messrs. Westray, Copeland & Co., of Barrow in Furness, show one of Burley's patent shearing machines. Messrs. Aveling & Porter have two road locomotives, a steam crane and a road roller. The Toronto Car Wheel Company has several patterns of cast-iron car wheels, with specimens of chills, etc., and Messrs. Kohnke & Bertram, of Dundas, Ontario, exhibit radial drills, slotting machines, and other tools for machine shops.

Valerie Mabilie, of Mariemont, Belgium, exhibits an assortment of European buffers, draw hooks, etc. P. Van den Kerchove, of Gand, Belgium, exhibits a double Corliss stationary engine and another smaller one with Rider's valves.

The Swedish department contains the only foreign locomotive in the Exhibition. It is a tank engine of three feet gauge, with six wheels coupled, and a pair of wheels under the foot-board arranged in a similar way to the radial arrangement patented by W. Bridges Adams. The wheels are all of the same size, and without measuring them, we suppose they are about a metre, or 39½ inches, in diameter. The engine has the following inscription on it: Kristinehamns Jernvaegs Mek. Werkstad (K. Jernvaeg's Machine Works). Another firm or company which rejoices under the name of the Surahammar Works exhibits the only specimens of European cast-iron chilled wheels in the Exhibition, which are marked "Arboga patent."

Altogether the foreign departments in the Machinery Hall are disappointing, and the representation of machinery is in no sense international, and in this department at least the Exhibition will not have the effect, which is so very desirable, of showing us our inferiority, in many directions, to the work done by engineers in other parts of the world.

In the American department the exhibits are, however, much more complete; but even there some industries, or branches of engineering, are very inadequately represented. This is especially the case in certain branches of railroad appliances. There is, or at least the writer saw, but one exhibit of a railroad switch, no rail fastenings, signals or appliances for supplying water or fuel.

The first thing which strikes a visitor on entering the American department is the display of machinists' tools made by Messrs. William Sellers & Co., and their machine which will plane 35 feet long and 10 feet square has almost an architectural effect by its immense proportions. Anything like a description will, of course, be impossible in a preliminary letter like this. They show many different kinds of tools, some of which are well known, whereas others have some novel features. Messrs. Ferris & Miles have a very creditable display of steam hammers, lathes, boring mills, planers, etc., which, with other similar displays, will be described more fully hereafter. The Pratt & Whitney Company, of Hartford, have a large assortment of small tools, consisting of machinists' gun and sewing-machine tools. The Putnam and Fitchburg machine companies each make a fine show. Messrs. C. Van Haagen & Co., of Philadelphia, Helles & Jones, of Wilmington, Del., the Brown & Sharpe Company, of Providence, and Thorne & DeHaven, of Philadelphia, all make very creditable shows, which there is neither time nor room to describe now.

There are more locomotives on exhibition than there was reason to believe would be sent some months ago. The Rogers Locomotive Works have an eight-wheeled American engine with 17x24 in. cylinders, which is a beautiful piece of work. The Danforth Locomotive & Machine Company has sent an anthracite-burning American engine and one narrow (3 ft.) gauge tank locomotive, with six wheels coupled. The Philadelphia & Reading Railroad Company has sent a ten-wheeled locomotive for burning anthracite coal. It is of the ordinary pattern employed on their road. Messrs. Por-



ter, Bell & Co. have a narrow-gauge (3 ft.) engine with four driving wheels coupled and with a two-wheeled Bessell truck in front. The Baldwin Locomotive Works exhibit five locomotives, two of the ordinary American pattern, two "Consolidation" engines, one of the Lehigh Valley Railroad and the other the Pennsylvania Railroad Company's pattern, and one "Mogul" engine. The Dickson Manufacturing Company shows an ordinary American engine of very good design, one narrow-gauge engine, and a small engine for iron works or furnaces. The Brooks Locomotive Works are represented by a narrow-gauge engine of the Mogul pattern, which is at work on the track around and inside the grounds.

Manufacturers of car wheels are well represented, and doubtless there has never been so good an exhibition anywhere before of chilled wheels as may now be seen in Machinery Hall. The Cayuta Wheel & Foundry Company, Messrs. McKee & Fuller, of Catsaugua, Pa., the Lobdell Car Wheel Company, the Baltimore Car Wheel Company, the Hamilton Steele-Wheel Company, the Ramapo Wheel Works, Davenport, Fairbairn & Co., the Paper Wheel Company, the Baddon Elastic Car Wheel Company, the Taylor Iron Works, the New Jersey Wheel & Foundry Company, Messrs. A. Whitney & Son, Messrs. Sax & Kear, Barnum, Richardson, & Co. and the Washburn Wheel Company all exhibit a great variety of their wheels, new and old, with specimens of chills, the ores from which they are made, sections of the wheels, and, in fact, almost everything relating to their manufacture.

The car spring men are also out in strong force. Messrs. A. French & Co., Nichols & Pickering, Vose, Dinamore & Co., and N. & A. Middleton, all show very full assortments of the articles they manufacture. The Standard Steel Wheel Works exhibit steel tires in every condition of their manufacture. The Wharton Switch Company has one of its switches and specimens of frogs, crossings, etc., on exhibition. Buntin, the car-seat man, affords the weary rest by offering to them one of his inviting car seats. Manufacturers of scales have, or will have, brilliant displays. The Fairbanks Company, Howe, Riehle Bros. and others are represented.

The Westinghouse Brake Company will exhibit its apparatus, which has already been described in these pages, for showing the operation of the automatic atmospheric and the vacuum brakes. Henderson's hydraulic brake is also shown on two car trucks. Messrs. W. C. Allison & Son show an assortment of pipes, bolts, rivets, etc., and Nathan & Dreyfus have two beautiful cases of their oil cups.

Of course it is impossible in notes gathered as hastily as these have been to give anything like a complete list of exhibitors of railroad material and machines. The cars are exhibited in the building devoted to carriages, which there was not time to enter, and the room of the Society of Civil Engineers was also left for a future notice, and necessarily much remains for description which, it is expected, will be given in future letters in these pages.

#### Too Low Rates.

The latest opposition to the extremely low rates from the Northwest to the East comes from the Chicago grain merchants. The Board of Trade appointed a committee which was to do everything possible to secure low grain rates from Chicago to the East. The low rates have come, but they are uncomfortably low for Chicago traffic. The grain merchant does not desire to have all the grain of the Northwest go through Chicago, unless it will stop for a time at Chicago, his business depending upon the transfer of the grain at that point. Now rail rates are so low that there is no advantage in shipping by lake, and the wheat put into a car in Wisconsin, Minnesota, Iowa, Nebraska or Illinois rolls tranquilly through Chicago to the Eastern consumer or exporter, without giving the produce merchant or elevator owner a chance of a commission or profit. Worse than that, for the present, the low rates caused such heavy shipments that the market was overstocked, prices were forced down, and holders suffered considerable losses. Both of these we believe to be legitimate subjects of complaint, since the change in the method of shipping and the fall in the prices were artificially caused by a policy which in its nature must be temporary. If the rates now received by the railroads were justified by a reduction in working expenses, no one could complain of the effect on business, however serious it might be; and, doubtless, a great deal of business would be quite destroyed by such rates; but as they have no such cause, and must occasion either a permanent loss to the railroad proprietors or the resort to unduly high rates hereafter to make up for the present losses, all whose business is unfavorably affected by the excessively low rates have good right to complain. Such fluctuations leave no solid basis for business; and even if we grant to railroad proprietors unlimited freedom to cut each other's throats, we cannot extend the license so as to include all other business men who are compelled to make great use of the railroads. Some way must be found to put an end to this barbarous practice. If the railroad companies will not find one to suit them, they may find one forced upon them—probably a crude and unjust one—which may be entirely unacceptable.

#### Centennial Travel.

With the opening of the Centennial Exposition, May 10, the travel to the Centennial grounds at Philadelphia began in earnest. On the New York Division of the Pennsylvania Railroad, between New York and Philadelphia, besides the regular express trains, 16 in number, four special excursion trains began to run May 10, leaving New York at 5:30, 6:30, 7:30 and 8 a. m., and the Centennial station at 4, 5:30, 6 and 7:30 p. m. The first morning and the last evening trains are slow trains, run at lower fare, the others make as good or even a little better time than the regular express trains. For the extra service required 85 new passenger cars and a number of engines have

been put in service on this division, and additional trains will be put on when the travel requires.

The fares fixed between New York and Philadelphia are varied to meet the different accommodations provided. For \$5 an excursion ticket is sold good for 15 days on any train, regular or extra, except the limited express, which is entirely a Pullman train; for \$4 an excursion ticket good on any but the limited express for one day only; for \$4 also a ticket good for 15 days on the special trains leaving New York before 7 a. m., and Philadelphia after 7 p. m.; for \$3 an excursion ticket good on the same trains for one day only, and for \$2 an excursion ticket good on the first morning and last evening special for one day.

To carry the Philadelphia suburban travel four extra trains are put on to run between Tacony and the Centennial depot, and 17 extras between Kensington, Frankford Junction and the Centennial.

May 9, about 100 extra passenger cars, all well loaded, were dispatched from New York, requiring a number of extra trains.

On the Philadelphia Division, between Philadelphia and Harrisburg, a number of extra local trains have been put on and more will be added as required.

The "New York & Philadelphia New Line," although so lately opened that it can hardly yet be said to be well known to the traveling public, has already felt the impulse of the Centennial travel, and carried a large number of passengers to the opening of the Exposition. No extra or special Centennial trains have yet been put on, but it is expected that the increase of travel already begun will require additional accommodations soon, and they will be promptly provided as required.

#### Record of New Railroad Construction.

This number of the *Railroad Gazette* has information of the laying of track on new railroads as follows:

*Peach Bottom.*—The Western Division is extended 4 miles, to Delta, Pa. It is of 3 feet gauge.

*Southwest Pennsylvania.*—Extended from Ferguson, Pa., south to Mt. Braddock, 8 miles.

*California Pacific.*—Track on the Tehama Branch is laid from Woodland, Cal., north 16 miles.

This is a total of 23 miles of new railroad, making 455 miles completed in the United States in 1876, against 229 miles reported for the same period in 1875, 423 in 1874, and 738 in 1873.

#### Technical Conventions.

The annual convention of the American Railway Master Mechanics' Association will be held this year in Philadelphia, beginning Tuesday, May 10. Arrangements have been made for the accommodation of members at the Hotel Aubrey, which is located in West Philadelphia, near the Pennsylvania Railroad depot.

The Master Car-Builders' Association will hold its annual meeting in New York, Wednesday, June 14.

The annual convention of the American Society of Civil Engineers will be held in Philadelphia, June 13.

APRIL EARNINGS have been reported so far by fifteen companies, all but three showing an increase compared with 1875. These increases vary from 1.7 to 75 per cent, eight are more than ten and four more than 25 per cent. Fourteen of these roads report earnings for the four months ending with April, and but two of them show a decrease. The increase is greater than 10 per cent. on ten lines, greater than 15 on eight, greater than 20 on four, and greater than 50 per cent. on three.

MASTER MECHANICS' CONVENTION will hold its meetings in the Hall of the Franklin Institute—the use of which has been tendered to the Association by the Institute—which is located on Seventh street, between Market and Chestnut.

### General Railroad News.

#### ELECTIONS AND APPOINTMENTS.

*Chicago, Braidwood & Southern.*—This company was organized recently at Paxton, Ill., by the choice of the following directors: C. Bogardus, S. P. Bushnell, B. F. Hill, J. W. Harris, M. B. Thomson, J. A. Scott, G. A. Campbell, E. W. Fulton, H. Clayton, S. Taylor, W. Kemp, S. S. Kimball, D. Keighin, J. A. Montelius, J. B. Meserve, J. Sheldon, W. Noel. The board elected Charles Bogardus President; Merton Dunlap, Secretary; A. O. Thompson, Treasurer.

*Catawissa.*—At the annual meeting in Philadelphia, May 1, M. P. Hutchinson was chosen President, with the following directors: J. V. Williamson, F. K. Shippen, E. Shannon, Emmer Weaver, Joseph O. Harris, John S. Graham. The road is leased to the Philadelphia & Reading.

*Illinois & St. Louis Bridge.*—At the annual meeting in St. Louis, May 8, the following directors were chosen: Gerard B. Allen, James B. Eads, William Tausig, John Jackson, John R. Lionberger, J. H. Britton, Julius B. Walsh, James T. Sands, Carlos S. Greeley, George Knapp, George E. Leighton, J. Pierpont Morgan, A. Iselin.

*Ware River.*—At the annual meeting in Palmer, Mass., May 3, the following directors were chosen: C. W. Chapin, J. A. Humrill, Springfield, Mass.; C. A. Stevens, Ware, Mass.; E. B. Gillett, Westfield, Mass.; Wm. Mixer, O. A. Perley, W. W. Whitney, Boston. The road is leased to the Boston & Albany.

*Red River & Rio Grande.*—The following are the directors chosen at the annual meeting: Francis Skiddy, H. A. Johnson, N. L. McCready, John Scullin, A. D. Jaynes, H. D. Mirick, R. S. Stevens.

*Kansas Pacific.*—At the annual meeting in Lawrence, Kan., May 4, the following directors were chosen: Robert E. Carr, John D. Perry, Carlos A. Greeley, Adolphus Meier, Stephen M. Edgell, St. Louis; Jay Gould, Sidney Dillon, James Smith, New York; Oliver Ames, Boston. There are two directors less than last year, B. W. Lewis, Jr., and Thomas A. Scott being omitted. There are no other changes.

*Wheeling, Pittsburgh & Baltimore.*—At the annual meeting in Washington, Pa., May 1, Colin M. Reed was chosen President, with the following directors: W. S. Bissell, S. B. Hayes, Wm. Workman, W. W. Smith, L. B. Ford, Wm. Keyser. The board elected J. B. Washington, Secretary; W. H. Kams, Treasurer; James L. Randolph, Chief Engineer; W. T. Thelin, Auditor. The road is worked by the Baltimore & Ohio.

*Greenville & Columbia.*—At the annual meeting in Columbia,

S. C., April 27, Mr. Wm. J. Magrath was re-elected President and the following directors were chosen: L. D. Childs, H. T. Farmer, F. F. Gary, Robert Adger, T. D. Wagner, B. L. McCaughrin, T. Hurley, A. Simonds, J. C. Roath, A. Macbeth, H. Beattie, J. B. E. Sloan.

*Central of Iowa.*—Mr. John C. Manly has been appointed General Freight Agent in place of C. A. Jewett. Mr. T. J. Fletcher, Auditor, is appointed Cashier.

*Cincinnati, Rockport & Southwestern.*—Mr. H. G. Hannaman, Treasurer, has been appointed Superintendent also, with office at Rockport, Ind.

*Green Bay & Minnesota.*—Mr. S. B. Kenrick, Superintendent, takes charge of the general passenger and ticket department also, in place of R. W. Nathans, resigned.

*American Society of Civil Engineers.*—The following additions to the list of members are announced in the Journal of the Society for April: Charles E. Billin (Junior), Assistant Pennsylvania Geological Survey, Box 2,580, Philadelphia; Samuel H. Chittenden, Fair Haven, Conn.; John E. Early, Resident Engineer Cincinnati Southern Railway, Somerset, Ky.; Casper W. Haines (Junior), Cheltenham, Pa.; Wm. H. McClintock, Assistant City Engineer, Louisville, Ky.; John McGee, Lima, Peru; Robert Moore, No. 221 St. Ange avenue, St. Louis, Mo.; George Y. Winer, Assistant Engineer, United States Lake Survey, Detroit, Mich.

*Cincinnati & Portsmouth.*—This company was organized at a meeting held in Mt. Washington, O., April 29, by the election of the following directors: Joseph Clair, Bethel, O.; George Schmitt, Amelia, O.; H. H. Willman, Olive Branch, O.; D. K. Este, Mt. Carmel, O.; Wm. H. Corby, Salem, O.; Abram Hopper, Hopper's Hill, O.; Henry Brachman, Benneville Kline, Mt. Washington, O.; Paul Mohr, Jr., Cincinnati. The board elected Benneville Kline, President; H. H. Willman, Vice-President; Henry Brachman, Treasurer; D. K. Este, Secretary; Paul Mohr, Jr., Consulting Engineer.

*Sioux City & St. Paul.*—At the annual meeting in Sioux City, Ia., May 1, the following directors were chosen: E. F. Drake, John L. Merriam, H. M. Thompson, A. H. Wilder, St. Paul, Minn.; Adrien Iselin, G. I. Seney, W. H. Brown, New York; A. H. Rice, G. W. Simmons, Boston.

*Chatham Branch.*—At the annual meeting in Chatham, N. B., May 2, the following directors were chosen: Alexander Morrison, J. B. Snowball, W. M. Kelly, F. M. Winslow, J. F. Letson. The board elected Alexander Morrison President; A. D. Sheriff, Secretary.

*Western & Atlantic.*—Mr. David W. Appler has been appointed General Ticket Agent, with office at Atlanta, Ga. He has been on the Central Railroad of Georgia for a long time.

*Grand Rapids & Indiana.*—Mr. P. S. O'Rourke, late of the Michigan Lake Shore, has been appointed Superintendent of the Southern Division.

*White Line.*—Mr. J. H. Steiner, of Indianapolis, has been appointed General Manager of this fast freight line.

*Central of New Brunswick.*—This company was organized at Fredericton, N. B., May 3, by the election of the following directors: E. R. Burpee, J. S. Covert, J. A. Fenwick, Alex. Gibson, G. G. King, C. W. Wetmore, G. H. White. The board elected Alex. Gibson President; J. L. Inches, Secretary.

*Brazil, Bainbridge & Indianapolis.*—Maj. R. J. Dukes, of New Albany, Ind., has been appointed Chief Engineer.

*Chicago, Burlington & Quincy.*—Mr. C. B. Wakeman has been appointed Master of Transportation of the Iowa Division.

*Atlantic & Pacific.*—Mr. D. Wishart is now General Ticket Agent, his duties being limited to the Atlantic & Pacific Railroad proper.

*Pacific of Missouri.*—This road being now separated from the Atlantic & Pacific, Mr. E. A. Ford is appointed General Passenger Agent.

*Tennessee Coal & Railroad Co.*—At the annual meeting in Nashville, Tenn., May 2, the following directors were chosen: W. H. Cherry, A. S. Colyer, Wm. Morrow, Thomas O'Connor, A. M. Shook.

*Lake Shore & Michigan Southern.*—At the annual meeting in Cleveland, O., May 3, the following directors were chosen: Albert Keep, Chicago; Henry B. Payne, Amasa Stone, Cleveland; William L. Scott, Charles M. Reed, Erie, Pa.; Andrew D. White, Syracuse, N. Y.; Cornelius Vanderbilt, Wm. H. Vanderbilt, Augustus Schell, Samuel F. Barger, Robert L. Crawford, John E. Burrill, Francis P. Freeman, New York. The only new director is Mr. White. (President of Cornell University and a gentleman of wealth), who succeeds J. C. Spencer. The board re-elected Cornelius Vanderbilt President; Wm. H. Vanderbilt, First Vice-President; Augustus Schell, Second Vice-President; Edwin D. Worcester, Treasurer; Geo. B. Ely, Secretary and Assistant Treasurer; C. P. Leland, Auditor; John Newell, General Manager; Charles Paine, General Superintendent; Charles Collins, Chief Engineer.

*Claremont & White River Junction.*—At the annual meeting recently the following directors were chosen: Hosea W. Parker, Otis F. B. Waite, R. W. Love, Claremont, N. H.; Orlando Powers, J. M. Davidson, S. W. Bryant, Cornish, N. H.; J. F. Raynsford, F. J. Morgan, W. C. True, Plainfield, N. H. The board elected H. W. Parker, President; T. A. Gleason, Clerk; G. W. Hunt, Treasurer.

*Louisville, Cincinnati & Lexington.*—Mr. John Kilkenny has been appointed General Passenger and Ticket Agent, in place of S. S. Parker, resigned.

*Delaware & Hudson Canal.*—At the annual meeting in New York, May 9, the old board of managers was re-elected, as follows: Abiel A. Low, Robert Lenox Kennedy, James M. Halstead, Le Grand B. Cannon, George Cabot Ward, James Roosevelt, James B. Taylor, John Jacob Astor, W. J. Hoppin, J. Pierpont Morgan, Robert S. Hone, New York; Thos. Cornell, Kingston, N. Y.; Thos. Dickson, Scranton, Pa. The board unanimously re-elected Thomas Dickson President.

#### PERSONAL.

—Mr. Seymour Clarke, Vice-President of the Great Western Railway of Canada, died in England, April 16. He was formerly Traffic Superintendent of the Great Western (England) and from 1860 to 1870 General Manager of the Great Northern. In 1870 he retired from active work, but was persuaded last year to take the position he held at the time of his death.

—The engineers and contractors who were employed on the Fourth Avenue Improvement on the New York & Harlem road when the late Mr. I. C. Buckhout was Chief Engineer, have erected to his memory a substantial granite monument in the cemetery at White Plains, N. Y., where his body lies buried.

—Mr. James B. Maxwell, formerly engaged on the Peruvian railways, and also, we believe, in Chile, has returned to this country, and is now residing at Conshohocken, Pa. Mr. John McGhee, who has spent some years in Peru, is expected to return soon to Marietta, Ohio. Mr. Ernest Pontzen, an Austrian engineer who visited this country a few years ago, and examined many American engineering works, and made the acquaintance of many American engineers, is one of the Austrian Commissioners to the Exposition and is expected in New York on the Frisia about the 18th.

—Mr. S. H. Dunan, formerly Auditor of the Baltimore & Ohio, and later of the Erie, where his "little unpleasantness" with President Watson made his name widely known for a time, is about, according to the *Financial Record*, to enter into a part-



nership with Mr. Eugene Robinson, of New York, in the stock and banking business. The firm name will be Eugene Robinson & Co.

### THE SCRAP HEAP.

#### Railroad Manufactures.

Richie Brothers, of Philadelphia, have recently put up a track scale of 100,000 lbs. capacity at Portsmouth, Va., for the Seaboard & Roanoke road. They have recently made and patented an improvement on their patent beam, which is said to facilitate greatly the weighmaster's work.

The Ohio Iron Company's rolling mill at Zanesville, O., is running double time. The blast furnace is doing well, using coke entirely for fuel. Its present hearth has been in for 3½ years.

The Terre Haute Car Works of Seath, Hager & Co., are to furnish 500 box cars to the Indianapolis, Bloomington & Western road. The price is \$485 each, payable in monthly payments.

An exchange says: "Messrs. Fisher & Norris, Eagle Anvil Works, of Trenton, N. J., have just turned out the largest blacksmith's anvil in the world. The cast-steel face is five feet in length, including the horn, and eight inches in width; it is welded in one piece to the body of the anvil. It weighs 1,380 pounds, and is intended for a part of the firm's Centennial exhibit at Philadelphia. It is especially interesting from the fact that so large a piece of steel has never been welded to iron before either in this country or Europe."

The Harlan & Hollingsworth Company, at Wilmington, Del., is building eight first-class passenger cars for the Scioto Valley road. Two of them have already been delivered.

The Brooks Locomotive Works, of Dunkirk, N. Y., send to the Centennial a narrow-gauge engine of Mogul pattern, weighing 16½ tons. It has 11-inch cylinders and driving wheels 36 inches diameter, steel boiler throughout, and is very carefully and finely finished. It is equipped with the Westinghouse air brake, has a West steam bell-ringer and will be in use on the railroad in the Centennial grounds.

The Thomas Iron Company has three of its furnaces in blast at Hockaday, Pa., the third one having blown in last week.

The Baldwin Locomotive Works now employ about 1,600 men, a part of them overtime. Orders have been coming in steadily.

The Ohio Falls Car Works at Jeffersonville, Ind., are to be sold at public auction in Charlestown, Clark County, Ind., June 10, by J. W. Sprague, agent for the trustees under the mortgage.

#### The Hotchkiss Mail Catcher.

An improved device for catching and delivering mails by a train in motion, invented by Mr. E. F. Hotchkiss, of Unadilla Forks, N. Y., was recently successfully tried on the Utica, Clinton & Binghamton road near Utica. It is described as follows by the Utica Herald: "The mail post consists of an upright made of galvanized pipe about an inch and a half in diameter. To this is attached a crane or depressed arm of iron on which the mail bags are hung. The crane can be lowered, to allow the mail bags to be attached, and is raised by means of a crank and pulley. The bag is hung to the crane by strings or loops. To the top of the car is attached, first, a knife which cuts the strings holding the bags. The bags then strike a set of springs fastened at the upper end, and slanting backward obliquely. There are two sets of these springs on the top of the car, and they break the concussion of the bags, so that when they reach the opening in the roof of the car through which they drop, their inertia is almost overcome. At the end of this opening is a set of wooden springs, and under the opening a box about three feet square which receives the mail bags. The side of the car opposite this box is to be grated and the bottom of the box slants downward toward this grating. This will prevent cinders from the locomotive accumulating in the box."

"The delivering apparatus is attached to the side of the car and operates on the principle of the mail catcher, reversed, the crane being on the car, and the 'catcher' on the ground by the side of the track. The crane is of iron rods, and about eight feet long and two feet across, being in the form of a square. It runs lengthwise with the car, and is hinged on the inside. The bags are attached to the outer bar, and when the mail box is reached, the crane is dropped outward by a lever. The crane will accommodate from 10 to 12 bags. The mail box is fitted with two sets of springs, and resembles an elevator. The box is to be kept locked, so that the mail bags will be safe from injury or theft. The merit of the invention is that the mail bags cannot be missed, and cannot get under the car, as is often the case on the cars now in use."

#### Rapid Construction of a Lattice Bridge.

On the 12th of April an order was given by the Boston & Albany Railroad to the Leighton Bridge and Iron Works, of Rochester, N. Y., for an iron bridge to replace one of the stone culverts washed out by the flood occasioned by the breaking of the Worcester dam. The span was 100 feet, angle of skew 42°. On account of the skew of the bridge greater time was consumed in preparing the patterns, as well as in the manufacturing of the ironwork itself, than would have been required had the bridge been square with the masonry. In just nineteen working days from date of order, and without any overtime being made, the south track was laid ready for trains to pass over. It is an undergrade bridge, with three trusses and iron floor. The time mentioned, nineteen days, includes an extra delay of two days on the railroad in the transportation of some of the manufactured iron from Rochester to Worcester.

The bridge is a riveted lattice truss, and the builders claim this work shows beyond dispute that riveted bridges can be completed in as short a space of time as can bridges of any other design. The time occupied in erection, complete, after material reached the ground, was four days.

#### A Narrow Gauge Parlor Car.

The Wilmington (Del.) Evening of recent date says: "The Jackson & Sharp Car Company are about completing, for exhibition at the Centennial, two cars, which, for elegance of design and finished workmanship, will, we are certain, equal if not surpass anything in that line to be seen at the great show for which they are intended. One will be a broad gauge first-class passenger car, the other a narrow gauge parlor car, and both will be provided with all the latest tested improvements for braking, coupling, etc."

"The parlor car is intended for the use of the Emperor of Brazil and suite upon state occasions in the Province of Sao Paulo, and is destined for the Sao Paulo & Rio de Janeiro Railroad, after its exhibition at the Centennial. The car is christened 'Dom Pedro II.' and is divided into four compartments—parlor, blue room and toilette room, for the use of Dom Pedro and his family, and the main compartment for the Emperor's suite. The woodwork is of the finest quality, the paneling being of French burl walnut and rosewood, while the panel frames are of ebony and black walnut. The furnishing of the parlor has been done with a view to comfort as well as elegance, and it is scarcely possible that utility and convenience, combined with beauty, could have been attained in a more satisfactory manner. The usual appointments of a well-furnished parlor are made to contribute, not only to the requirements of a refined taste, but also to the more urgent demands of physical comfort. The upholstery is rich to a degree, being of silvered maroon, peculiarly adapted to exclude heat and dust, a most excellent quality in railroad car chairs. The trimmings of the chairs, sofas, etc., are of crimson-colored silk fringe; the window shades are of green flowered silk rep; the carpet, of tapestry Brussels, and of most exquisite pattern, is in keeping with the elegance of the surroundings."

"We now come to an article which though a rarity in connection with railroad travel, is, perhaps, the most attractive that could be offered to a gentleman of taste and culture with which to while away the tedious moments of a railroad journey—a fine ebony book-case, filled to repletion with the choicest works of standard English and American authors. A cursory glance revealed, among many others of equal value and interest the following: 'Taine's English Literature,' 'Charles Lamb's complete works,' also 'Dickens' complete works,' 'Langhorne's Plutarch' in five volumes; 'Transactions of the American Institute from 1869 to 1871,' 'Three Months in Brazil,' and Black's 'Picturesque Tourists of England.' Mounted in a photographic stand upon the book-case is a photograph of the Emperor and his daughter, the latter, in the present absence of her parents from Brazil, exercising the important functions of regent. Opposite the bookcase is a cupboard, also of ebony, intended for cakes, wine, canned fruits and meats, and other nick-nacks agreeable to the royal palate. Leaving the parlor we enter the blue room, which, though much smaller, is equal in the elegance of its appointments to the other, and is so arranged that in a few moments it can be converted into a sleeping apartment. In this room the upholstery is of blue plush, the trimmings of blue silk and all fashioned and finished in the best style of the upholsterer's art. Here the curtains are of white lace looped back with blue ribbon. As will be seen by the above the prevailing color in this room is blue; hence the name."

"In the main compartment the only noticeable difference is in the chairs, the design and finish of the car being the same throughout. Here, however, the chairs are the double, stationary, reversible ones, common to all first-class passenger cars, and in the place of upholstery they are bottomed and backed with cane, which in the torrid climate of Brazil will be infinitely cooler and quite as comfortable as the best upholstery fabrics. It is probable that this car will be sent up to Philadelphia some time during the present week."

"The other car, mentioned at the beginning of this article, is named 'Delaware,' and is being built for no one in particular, but expressly for the purpose of exhibiting the workmanship of the company at the coming Centennial, and we are satisfied they need fear no comparison with any work of this class that may be there on exhibition, for, aside from the stability and beauty of the materials used, the design and workmanship are of the highest order, and reflect great credit upon the Jackson & Sharp Co., and their efficient corps of workmen."

#### Steam Street Cars.

The following report was presented to the Committee on Science and the Arts of the Franklin Institute, at its monthly meeting in Philadelphia, May 3, by a sub-committee consisting of G. Morgan Eldridge, Edward Longstreth, Henry Cartwright and C. Chavot:

"The sub-committee of the Committee on Science and Arts, constituted by the Franklin Institute of the State of Pennsylvania, appointed to examine and report upon the use of steam and other motors upon street cars, respectfully report: That it is not necessary to consider motors other than steam, because if a car will run practically in the street by self-contained power, it may be propelled by power of any kind. Compressed air, ammonia, electricity and other agents have been proposed, but as yet steam only has been practically successful as a motor. The objections urged against steam—to wit, fire, smoke, noise, do not apply to the other agents, and, therefore, if steam is available, they are more so, if they will practically and economically drive a car. The popular objections to the use of steam on street cars may be summarized as follows:

- "First. The frightening of horses.
- "Second. The difficulty in controlling the car.
- "Third. Heat from the boiler.
- "Fourth. Cinders and smoke.

"As to the first objection, it is found, whenever cars have been run by steam upon thoroughfares frequented by horses, that the horses soon become familiar with and indifferent to them. Locomotives run upon Delaware avenue without difficulty with the horses used there; the shifting engines of the North Pennsylvania Railroad run into the city as far as Front and Noble streets, over a very crowded thoroughfare, without trouble on that score, and two different steam cars have been run upon the streets in this city within six months, both of which were noiseless and did not frighten the horses. Knowing as we do that the safety and efficiency of railway trains have been so largely increased by the introduction of the power brake, it is plain that the substitution of steam for hand brakes upon street cars will be equally advantageous. The heat may readily be kept from the body of the car by a non-conducting partition, as is now done, and in winter the car may be easily and cheaply heated by steam, without interfering with the passenger space. As to cinders and smoke, there are appliances readily available by which their escape can be prevented, as is demonstrated upon the two cars before named, and the use of these can easily be enforced. There then remains the practical question of the feasibility of the use of steam, in a mechanical point of view. It is plain, in view of the public tests which have been made, that there is no difficulty in running cars over the streets upon the rails in use in this city, through switches and around curves, at a higher rate of speed, under better control and with greater safety by steam than with horses; and in addition there is this great advantage, that while with horses only the same number of cars that are in ordinary use all day can be put upon the road at hours when the crowd of travel presses upon it, by the use of steam additional cars can be attached at such time, and the capacity of the road can be doubled or trebled with no increase of expense other than the consumption of a few extra pounds of coal at the time when the travel is the greatest. We are of the opinion, therefore, that the broadest field should be opened by the legislative and municipal authorities for the introduction of this improvement, which is imperatively demanded and for which the time is fully ripe. It makes practicable rapid transit, in the ability to stop and start quickly, and to maintain a much higher rate of speed than with horses; it meets the public need by the ability to put an increased number of cars upon the street just at the hours when they are required, and it opens the way to low fares by the use of coal as a relief from the high price of horse feed."

### OLD AND NEW ROADS.

#### Anderson, Lebanon & St. Louis.

The track is expected to be finished to Noblesville, Ind., next week, and a mixed train will be put on to run between Anderson and Noblesville. The distance is about 20 miles.

#### New York & New England.

After many delays the new through line between Boston and Philadelphia began running last week. As before noted the line is over the New York & New England from Boston to Wilmington; Hartford, Providence & Fishkill from Wilmington to Hartford; New York, New Haven & Hartford from Hartford to Mott Haven; thence the cars are carried to Jersey City by the steam ferry-boat Maryland and run to Philadelphia over the Pennsylvania road.

#### Intercolonial.

The St. John (N. B.) Telegraph says: "The piece of road between Campbellton and St. Flavie, completing the Intercolonial Railroad, is expected to be opened early in June. The distance is about 105 miles, half of which, 50, has to be ballast-

ed. There is also a good deal of ballasting wanted between Moncton and Campbellton. There are five ballast trains at work on the road, and they will be speedily increased to 27 trains, equal to 300 cars a day, aided in their operations by two or three steam shovels, whose *modus operandi* is something very astonishing."

#### Cincinnati & Martinsville.

This road is to be sold under foreclosure of mortgage at Franklin, Johnson County, Ind., June 20. It is 39 miles long, from Martinsville, Ind., to Fairland, and is now worked by the Indianapolis, Cincinnati & Lafayette Company under a temporary lease.

#### Toledo & South Haven.

A company has been organized in Michigan to build the division of this proposed narrow-gauge road which is to extend from Bangor, Mich., to Lawton, 22 miles. It is proposed to use the four miles of the old Paw Paw road as part of the new line.

#### Meetings.

The following companies will hold their annual meetings at the times and places given:

- Grand Rapids, Newaygo & Lake Shore, at the office in Grand Rapids, Mich., June 15.
- New York Central & Hudson River, at the office in Albany, N. Y., June 7, at noon.
- Central Vermont, at the office in St. Albans, Vt., May 16, at noon.

#### Indianapolis, Bloomington & Western.

Receiver Wright has been authorized by the Court to lease 15 engines from the United States Rolling Stock Company, to meet the immediate necessities of the road.

#### Southern Pacific.

A San Francisco dispatch says: "A memorial has been prepared by Anthony Ezl, Jr., R. Robinson and Anthony Goldi, stockholders of the Southern Pacific Railroad Company, addressed to the Stock Exchange of New York, and principal European financial centres, stating in relation to the character and standing of bonds of the Southern Pacific that the Central Pacific and Southern Pacific are one and the same company; that the property of the Southern was acquired by earnings of the Central, and the Southern is now and always has been under the management and direction of the Central; that said bonds are invalid because no occasion or necessity existed at the time of making them to warrant their issuance, and they are unauthorized by law. The memorialists are making this statement to advise these several exchanges as to what they consider the real standing of said bonds, and will also file a bill in a court of this State to obtain a decree declaring said bonds illegally and improperly issued." It is difficult to see how the value of the bonds would be affected if these charges were true; but the effect of the memorial might be to injure the sale of such bonds, which, perhaps, is what is aimed at.

#### New Brunswick.

This road has suffered severely from the spring storms and freshets. The long bridge over the St. John River was badly damaged by the freshet which carried out the ice, and last week an enormous land-slide near Muniac, N. B., covered the track for some 300 feet and to a great depth with gravel and boulders.

#### Grand Trunk.

This company asks proposals for the purchase of old iron rails, delivered as follows: About 7,000 tons at Toronto, Sarnia, Detroit Junction or Buffalo; about 1,000 tons at Montreal or Pointe Lévis, and about 3,000 tons at Portland. The company has wharfage accommodation for shipment by water at Toronto, Sarnia and Portland, and deliveries would be made commencing with May, and extending through the summer. Offers stating the price per ton (of 2,240 lbs.), and the place of delivery, will be received by Joseph Hickson, General Manager, at Montreal, up to May 15.

#### Burlington & Keosauqua.

It is proposed to build a narrow-gauge road from Burlington, Ia., nearly due west to Keosauqua, about 40 miles, through a fertile and well settled country, at an average distance of eight or ten miles from other railroads.

#### International & Great Northern.

The officers of the company have been negotiating with property holders of Austin, Tex., as to the donation of a depot site in that city. There is much difference of opinion as to location, which will probably be settled by a compromise.

#### Dividends.

Dividends have been declared by the following companies: Pennsylvania, 2 per cent., quarterly, payable May 20 to ladies only; to all others May 30. Cleveland & Pittsburgh (leased to Pennsylvania Company), 1½ per cent., quarterly, payable June 1. Stony Brook, 3 per cent., semi-annual, payable on demand. The road is leased to the Boston & Lowell.

#### Missouri, Kansas & Texas.

The Union Trust Company, of New York, gives notice that it will pay \$20, gold, on each of the coupons maturing in January and February, 1876, on Missouri, Kansas & Texas first and Union Pacific, Southern Branch, first-mortgage bonds, to such holders as will sign the agreement of March 1, 1876, present their bonds to be stamped and deposit the past-due coupons to be exchanged hereafter for second-mortgage income bonds, as provided in that agreement.

#### Union Pacific.

The Committee on Pacific Railroads of the House of Representatives has prepared a bill providing that it shall not be lawful for this company to charge any special or greater rate for the transportation of freight or passengers over the Omaha bridge than that charged for a like distance over other portions of its road, nor shall it charge other companies more than \$5 for every freight or passenger car and contents transported over said bridge, and in case of the transportation of coal, salt, grain, or lumber, not more than \$2.50 per car shall be charged to other companies.

This bill is intended to give effect to the late decision of the Supreme Court which locates the Eastern terminus of the road on the Iowa side of the Missouri River.

In response to a letter from the Committee of the House, President Dillon replies that he has not yet had time to prepare any new proposition for the creation of a sinking fund to meet the eventual liabilities of the company to the Government under the second mortgage, but should any such proposition proceed from the committee, or in any way from the Government, the company will give it immediate and careful consideration. He urges the committee to reconsider its decision that it would be inexpedient to accept any plan including the proposition heretofore made by the company to recover its unsold land-grant to the Government at a fixed price as a basis for the proposed sinking fund.

#### Pennsylvania.

The extension of the East Brandywine & Waynesburg Branch westward to New Holland is all graded and tracklaying has been begun. The extension is 11 miles long and runs by a winding route with some grades from Waynesburg around the foot of Welsh Mountain into the fertile Conestoga Valley. The grading has been provided for by the people along the line,



the Pennsylvania agreeing to furnish the iron and work the road.

The new passenger depot at Thirty-second and Market streets, West Philadelphia, is so far completed that trains began to run to and from it May 7. The new building, which has been already described, is a great improvement upon the old one, which was only a temporary structure, but had been in use several years.

#### Dayton & Southeastern.

Messrs. Phelps, King & Co., contractors for this road, will receive at their office in Dayton, O., proposals from sub-contractors for the grading of 20 miles of the road. The profiles are ready for inspection.

#### Philadelphia & Reading.

This company has begun to run through express trains from Philadelphia to Allentown, Wilkesbarre, Scranton, Elmira, and western points in connection with the Lehigh Valley and Erie roads. The connection with the Lehigh Valley is made over the lately finished Perkiomen Railroad.

This company has, it is said, purchased Tinicum Island in the Delaware River, a few miles below Philadelphia, and intends to establish there a coal shipping depot and also wharves and other conveniences for handling the Western freight, which it expects to receive over the new line referred to above.

#### Pittsburgh, Titusville & Buffalo.

In the long suit of the Pennsylvania Transportation Company against the old Oil Creek & Allegheny River Company, the former corporation has obtained a verdict for the full amount claimed, \$197,285. The suit was based upon a contract made in 1871, under which the Transportation Company, which owned a system of oil-pipe lines, agreed to deliver all the oil which it controlled to the Oil Creek road, receiving in return a portion of the freight, which, after some fluctuations, was fixed at 10 cents per barrel. This amount was paid until the Oil Creek road passed into the hands of a receiver, and the present suit was for the amount accrued since that time. The new railroad company, organized since the foreclosure sale of the road, claims that it is not liable, and, if this is established, the verdict just obtained will be of little benefit to the Transportation Company.

#### Green Line Freight Rates.

A convention was held in St. Louis, beginning May 2 and continuing three days, to settle the rates from St. Louis, Chicago, Cincinnati and Indianapolis to the Southern points reached by the Green Line. The roads represented were the St. Louis, Iron Mountain & Southern, the Cairo Short Line, the Louisville & Nashville, the New Orleans, St. Louis & Chicago, the East Tennessee, Virginia & Georgia, the Memphis & Charleston, the Mobile & Ohio, the New Orleans & Mobile, the Vicksburg & Meridian, the Nashville, Chattanooga & St. Louis, the Western & Atlantic, the Mississippi & Tennessee, the Mississippi Valley Transportation Co., and the Anchor Line, the two last being steamboat lines. After much discussion it was resolved to adopt the rates in force in December last. The convention adjourned subject to call of the Chairman, Mr. M. H. Smith of the Louisville & Nashville.

#### Illinois Central.

The Land Department reports for April sales of 909.12 acres land for \$5,781.92. Cash collected on land contracts amounted to \$16,929.64.

The Traffic Department reports earnings for April as follows:

	1876.	1875.	Dec.	P. C.
In Illinois, 707 miles.....	\$423,126 50	\$458,772 74	\$42,640 24	9.3
In Iowa, 402 miles.....	129,955 30	144,086 30	21,731 00	15.5
Total, 1,109 miles.....	\$553,081 80	\$602,859 04	\$64,371 24	10.5

The average earnings per mile were \$598 in Illinois, \$306 in Iowa, and \$492 for the whole line.

#### Hamilton & Northwestern.

At the annual meeting in Hamilton, Ont., recently, the President reported that the net earnings of the Lake Erie Division of 32 miles were \$29,815 in 1875, being a considerable decrease from 1874. The Northwestern Division, from Hamilton to Georgetown, has been put under contract and is to be finished about the close of the year.

#### St. Lawrence & Ottawa.

This company and the Canada Central have concluded an agreement to maintain rates on the business between Ottawa and the St. Lawrence River. Rates on both passengers and freight between Ottawa, Prescott and Brockville have been raised about 50 per cent.

#### Chesapeake & Ohio.

The court has authorized Receiver Wickham to contract for five freight engines at \$9,781.80 each, payment to be made, \$1,000 cash on delivery of each engine, and the balance in 14 equal monthly payments.

#### Central, of New Brunswick.

This company, which is one of those which are to receive subsidies from the New Brunswick Government, was organized at a meeting held in Fredericton, N. B., May 3. Several of the directors are connected with the New Brunswick Railway.

#### Atlantic & Pacific.

The St. Louis Republican says: "There have recently been filed in the recorder's office of Greene County, deeds of considerable importance from the Atlantic & Pacific Railroad Company, transferring to Oliver Ames, Geo. S. Curtis, Jacob Sleeper, Uriel Crocker and F. B. Hayes, capitalists of Boston, 96,647 acres of land lying in Greene, Dade, Polk, Stone, McDonald, Barry, Lawrence and Newton Counties, in this State, and Benton County, Arkansas. The consideration mentioned in the deed is \$308,949.57."

#### Wabash & Erie Canal.

It is now proposed to build a narrow-gauge road from Toledo, O., to Terre Haute, Ind., using the canal as the road-bed for the railroad.

#### Cincinnati, Hamilton & Dayton.

Contracts have been let for 15 miles of new iron rails, to be used for renewals on the Indianapolis Division.

#### Fort Madison & Northwestern.

An election is to be held in Fort Madison, Ia., on the question of voting a 5 per cent. tax in aid of this road, which is to extend from the Mississippi at Fort Madison, northward to a connection with the Chicago, Burlington & Quincy road. The route is not yet fully decided on.

#### Seattle & Walla Walla.

A section of 15 miles of this road has been let, the contractors agreeing to begin work at once. It is to extend from Seattle, W. T., to some coal mines, the business from which is expected to yield an immediate return on the cost of the section.

#### Mackinaw & Marquette.

The State Board of Control of Michigan met May 8 and awarded the contract for this road to a corporation known as the Marquette, Sault Ste. Marie & Mackinaw Railroad Company, of which Mr. W. L. Wetmore, of Marquette, is President. The contract was awarded to the same company two years ago, but it was unable to comply with the conditions. It is stated now, however, that the company has secured the necessary capital and is prepared to begin work at once.

The road is to be about 150 miles long, from Marquette on

Lake Superior east by south to the Straits of Mackinaw. The State offered a grant of the State swamp lands not to exceed 16 sections per mile to any party willing to build the road. It has to be completed by December, 1877.

#### Hannibal & St. Joseph.

The trustees under the mortgage invite proposals for the sale to them of \$60,000 of the land bonds of the company, in accordance with the terms of the mortgage. Proposals will be received until May 18 at noon, at the office of Ward, Campbell & Co., No. 56 Wall street, New York, or of Charles Merriam, No. 26 Sears Building, Boston.

#### Delaware, Lackawanna & Western.

The preparations for the change of gauge are being hurried forward as fast as possible. The time for the change of the track, however, has not yet been fixed, but will probably be in June.

#### Delaware & Hudson Canal.

At the annual meeting in New York, May 9, President Dickson's report was presented, the capital account showing a total of credits amounting to \$35,943,795.46, with a balance of profit and loss amounting to \$2,544,797.85. He referred to the opening of the New York & Canada road and said that the remaining 12 miles from West Chazy to Bouse's Point would be finished in July. He said that the prospects of the coal business for this year were not encouraging and that little improvement could be expected while the iron and other manufacturing interests remain depressed as at present. He therefore recommended a temporary reduction in the rate of dividend paid, which is now 10 per cent.

#### Delaware, Lackawanna & Western—Morris & Essex Division.

A remarkable explosion of the materials used in blasting in the new tunnel through Bergen Hill took place on the night of May 6. The material, consisting of "rend-rock" powder and dynamite, made up in cartridges, was stored in a small brick building, constructed for the purpose and situated on the eastern slope of the hill, near the mouth of the tunnel. This building was utterly destroyed, leaving only a hole in the ground where it had stood; the ground was so shaken that many houses on the hill were badly wrenched and twisted, besides having windows broken and minor damage done. Windows were broken and houses jarred in Jersey City and Hoboken and even in New York, three miles away. No damage was done to the tunnel, however, and no person was hurt seriously. The cause is entirely unknown, though there was a suspicion that it was done by some striking workmen. This seems hardly possible, however, as the only entrance to the building was by a strong iron door, the key of which was kept by a watchman said to be trustworthy. The amount of explosive material stored could not be accurately ascertained.

#### Grand Rapids, Greenville & Alpena.

This unfinished road was sold at public sale under foreclosure of mortgage in Grand Rapids, Mich., May 6, to Wm. W. Niles, of New York, for \$1,000. Over \$100,000 was expended on the grading between Greenville, Mich., and Rockford, three years ago.

#### Rockford, Rock Island & St. Louis.

Mr. Thomas J. Robinson, a bondholder, has filed a bill in the United States Circuit Court, asking to be admitted as a party in the suit lately begun by Miss Hooper. The bill is very similar to that in the Hooper suit, charging that Mr. Osterberg's management has been contrary to the real interest of the bondholders, and asking that a new receiver be appointed.

#### Cairo & Tennessee River.

A party of engineers is now surveying the line of this road from Paris, Tenn., southwest to the Tennessee River.

#### Canadian Pacific.

Proposals are asked for the grading of several sections of this road in Manitoba, about 117 miles in all, and also for some of the tracklaying. All information can be obtained from Mr. F. Braun, Secretary of the Board of Public Works, at Ottawa, Canada.

#### Connecticut Railroads in 1875.

The Hartford Courant says that the annual report of the Connecticut Railroad Commission, just published, "shows that the roads as a whole have done better a little this year than last. The gross receipts were \$12,020,174.21 (a gain of \$98,995.50), of which 49.8 per cent. were from passengers and 42.7 per cent. from freight. Fourteen companies had some "net receipts" greater or less in amount, and nine companies had no net receipts at all. Eight companies paid dividends aggregating \$2,550,018, the average rate being 9.24 per cent. The Stonington road, with 2½ per cent. quarterly, paid the highest; the Danbury & Norwalk, with 1½ quarterly, paid the lowest. The total operating expenses for the year were \$7,887,142.78—\$133,613.89 less than the last year. With all the talk of reduction of force the net reduction for the year was only 252 men, and 6,689 men are now employed on the roads. The average cost of running a train a mile ranged from \$0.791 on the Shepaug to \$1.30 on the Consolidated.

"Among the other facts of the year may be mentioned the reorganization of the old Air Line road, the opening of the through line from Saybrook to Springfield, and the establishment of the New York & New England road over the old Boston, Hartford & Erie line. These changes affect the tables of capital, cost of road, debts, etc., as also do the paying off of \$1,138,797.10 of the debt of the Consolidated road, and increases of \$237,841.48 in the debt of the Connecticut Western, \$133,355.46 in the debt of the Connecticut Valley, \$81,172.99 in the debt of the Hartford, Providence & Fishkill road, and sundry other increases or decreases of the debts of roads more remote from here.

"As a rule the roads are in good condition, and the Commissioners answer the question whether the companies can keep up their net incomes safely by pointing out that owing to the great changes in the price of metal and of labor it is possible now to build much more permanently than it used to be. The Housatonic road has been almost entirely rebuilt since 1869, a number of fine bridges have been built, and through the State the new roads are being improved. The Providence & Fishkill road recovered from its washout with a loss of only \$22,000. Of 10,734,868 passengers carried during the year on all the roads no one was killed by any cause beyond his own control, and only two injured by such causes. Eighteen careless people were hurt, three being killed.

"The Commissioners believe in the stopping of trains before drawbridges, showing by citing cases that automatic signals cannot always be depended on, and then, alluding to signals, take up the question of grade crossings, of which there are 1,055 in the State. The Board doubts if gates and signals will, after all, save life in such places of peril, for these lessen the sense of personal responsibility of travelers so much that they run into danger. A wise suggestion is to increase the power of the Board so that it may have such crossings abolished wherever possible.

"The total par value of railroad stock in the State is \$59,822,784.62, and the sworn market value is \$35,003,762. Of eleven roads, including the two that we hold stock in, there is no value given for the stock. There are 4,215 holders of railroad stock in Connecticut. The debts of the roads are \$14,163,058.55 funded, and \$2,892,415.62 floating—a total of \$17,077,739.60.

"The Courant says that the report is, in many respects, a different document from its recent predecessors, and is not likely to share their fate. Three successive reports have failed to be accepted by the legislatures, several of them having been patently unworthy of the indorsement of the State. But this bears evidence of careful work, contains facts of apparently authentic value, and is full of instructive tables."

#### Long Island.

This company has leased the roads operated heretofore by the Flushing, North Shore & Central and the Southern, of Long Island, and the whole system will hereafter be worked under one management. The Long Island Company has already taken possession and is now working over 300 miles of road, including all the steam railroads on the island, except three short, light passenger lines, two from Brooklyn to Coney Island and one from East New York to Canarsie.

The Long Island Company leases the lines of the other two companies at a fixed yearly rental, giving no guarantees of interest or other payments further than the stipulated rent. The same parties now hold the controlling interest in the stock of all three companies, and the leases are made to simplify the management, and enable the Long Island Company to make better arrangements as to shops, depots and terminal facilities, as well as to avoid unnecessary expenses and train service at competing points.

#### Lake Shore & Michigan Southern.

At the annual meeting in Cleveland last week, last year's board of directors were re-elected without opposition, but one change in the list of directors being made. The old officers were all re-elected.

The terrible storm which passed over Chicago May 6 struck the freight depot of this company, stripped off the roof, 800 feet long, and leveled the side wall, doing much damage to freight in the building, and badly injuring six of the laborers employed there.

#### Western Counties.

Messrs. Shanly & Plunkett, contractors for this road, invite tenders for the superstructure of a railroad bridge across the Sissiboo River at Weymouth, Nova Scotia. The bridge is to consist of nine fixed spans of 80 feet each, nine spans of 30 feet, and a draw span of 50 feet. Further particulars will be furnished on application to the contractors at Digby, N. S.

#### Wisconsin Central.

The contractors for the Portage Extension have a large force at work between Hancock, Wis., and Portage, and expect to have the road-bed completed by July 1. The grading in many places is more difficult than was anticipated, an unexpected amount of rock cutting being required in the bluffs.

#### Portsmouth & Dover.

A special meeting of the stockholders is to be held in Portsmouth, N. H., May 16, to consider the question of issuing new stock to an amount sufficient to retire the floating debt, which is about \$82,000.

#### Claremont & White River Junction.

At the recent annual meeting in Claremont, N. H., a committee was appointed with authority to negotiate with any parties who may be willing to undertake the construction of the road.

#### Toledo, Wabash & Western.

The Advisory Committee appointed at the recent meeting of stockholders has issued a circular urging all stockholders to pay promptly the assessment of 25 cents per share, in order that the Committee may be enabled to take steps necessary to prevent the foreclosure sale of the road.

#### Charlotte, Columbia & Augusta.

Col. John B. Palmer, President of this company has recently negotiated the sale of \$500,000 first and \$500,000 second-mortgage bonds, at a price which enables the company with the proceeds to retire the whole of its floating debt. The authorized issue of second-mortgage bonds was \$1,000,000, but the terms of the present negotiation require that the issue shall be limited to the \$500,000 now sold. The bonded debt of the company, with these new bonds, will now be \$2,500,000 (\$2,000,000 firsts and \$500,000 seconds), or \$12,821 per mile, and the annual interest charge \$175,000, or \$897 per mile. For the last fiscal year the net earnings were \$250,004, so that, with no increase of earnings, there would be a surplus, after paying interest, of \$75,000, or over 3 per cent. on the stock upon which the company is liable to pay dividends. The company, being relieved of the burden of the floating debt, will also be able to go on and make some needed improvements on the road.

#### Erie.

The Western Division shops at Hornellsville have begun to run eight hours per day. For some time past they have been making only 35 hours per week.

Receiver Jewett's report for January may be summed up as follows:

Balance from last account.....	\$391,867 26
Transportation account, freight.....	\$1,483,378 81
" " passengers.....	268,848 38
" " miscellaneous.....	71,267 64
Interest, sale of materials, etc.....	1,813,494 83
Loans and receivers' certificates.....	54,376 85
Old account.....	243,460 00
	26,869 98
Total receipts.....	\$2,528,769 09
Traffic balances, pay-rolls, materials, etc., on transportation account.....	\$1,668,424 90
Rents.....	216,265 86
Taxes and insurance.....	59,732 35
Purchase of engines and cars.....	65,075 00
Interest and miscellaneous accounts.....	62,682 28
Old account.....	51,196 51
	2,123,376 90

Balance at close of month.....\$416,392 19

The amount of receivers' certificates issued was \$250,000; amount paid off, \$56,539.40, leaving \$800,000 outstanding Feb. 1.

The referee appointed to examine the Receiver's accounts from May 27 to Dec. 31, 1875, reports that they have been found correct and that the books are carefully and systematically kept. The referee reports that the coal lands bought by the company are now held by the Hillside Coal & Iron Company and the Northwestern Mining & Exchange Company are valuable and that the control of them will enable the Receiver to secure coal for the road at a considerable decrease from prices heretofore paid, without taking any account of profit on sales to other parties. The present value of the lands exceeds the price paid, and as the workings are extended a large profit can be realized. The Receiver has advanced altogether \$175,134.30 on account of the Hillside, and \$98,879.93 on account of the Northwestern Company. The original cost of the land was \$1,094,028.

#### Central Pacific.

In response to a letter from the Portland (Oregon) Board of Trade, this company expresses its willingness to build the proposed branch from Winnemucca, Nev., to Portland on the following terms: The company to be guaranteed 7 per cent. interest on \$3,000,000 for 30 years; the road to be exempted from taxation until the net earnings exceed the interest on the capital invested; the Legislature to authorize the city of Portland to subscribe in aid of the road a sum not to exceed \$1,000,000 in 8 per cent. bonds.

The Board of Trade agreed to recommend an agreement



with some modifications from this: the guarantee of interest and the exemption from taxation to extend not more than 20 years, and the sum to be raised by Portland to be limited to \$500,000.

The distance from Winnemucca to Portland is about 350 miles, and the route is said to be a practicable one, and its construction almost as cheap as would be the completion of the connection with Oregon by the present Oregon Division. The extension of that division through the mountain region of Northern California and Southern Oregon to a connection with the Oregon & California road presents very great engineering obstacles and would be enormously expensive. Winnemucca is the most northerly point of the Central Pacific in Nevada, and the line from that point would give Oregon a very direct Eastern rail connection, and a California connection sufficiently direct for all practical purposes. The length of road to be built could be considerably shortened by making a connection with the Oregon & California road south of Portland.

#### South Pacific Coast.

This road is intended to run from Dumbarton Point, Cal., on the east side of the bay of San Francisco, southeast to Alviso and thence southward to Santa Cruz, a distance of about 45 miles. A considerable force is now at work on the grading and trestle-work between Dumbarton Point and Alviso, and 500 tons of rails have been bought. The company has bought a large tract of land for wharf and depot purposes at Dumbarton Point and is building a ferry boat to ply between that place and San Francisco. The road is to be of 3-foot gauge.

#### San Francisco & North Pacific.

The work on the Guerneville Branch is now well advanced. The grading is finished for some distance beyond the Russian River crossing, the piers of the bridge there are completed and the bridge is being erected.

#### New York, New Haven & Hartford.

A general reduction of 10 per cent. in all salaries and wages paid by the company was made May 1. It is stated that this company has not reduced wages heretofore as its neighbors have, and that the wages now paid, even with the 10 per cent. reduction, are still above the standard of the New England lines generally. The reduction applies to the general officers as well as all other employees.

#### Concord.

This company has adopted the Westinghouse air brake and will fit up all its passenger equipment accordingly.

#### Detroit, Lansing & Lake Michigan.

Some of the Boston bondholders have begun proceedings for the foreclosure of the mortgages upon this road. Interest has, for some three years past, been paid one-half in cash and one-half in preferred stock.

#### Springfield, Athol & Northeastern.

A survey has been made for a branch to leave this road just outside of Springfield, Mass., and run northward to the manufacturing village of Chicopee Falls. The distance is 2½ miles, and the estimated cost \$60,000.

#### The Hoosac Tunnel Line.

The contract of N. C. Munson for the construction of the new line of the Troy & Greenfield road between Charlemont and Shelburne Falls has been declared forfeited because of the suspension of work by his failure. The Governor and Council have directed Manager Prescott to let a new contract for the completion of the work.

#### Cincinnati & Portsmouth.

At a meeting held in Mt. Washington, O., April 29, the organization of this company was completed. Subscriptions to a large amount have been secured, and one installment called in. Arrangements have been made for the survey and location of the line, and the company expects to begin work before long. It is to be a narrow-gauge road.

#### Central, of Iowa.

Notice is given that a meeting of holders of first and second mortgage bonds will be held at No. 225 South Sixth street, Philadelphia, May 13, at noon, to take action upon the question of changing the trustee under those mortgages.

#### Atlantic & Lake Erie.

This company has changed its name to the Ohio Central Railroad Company, and has filed the necessary certificates with the Secretary of State of Ohio.

#### Michigan & Ohio.

The route of this projected road has been changed so as to make the Ohio River terminus at Gallipolis instead of Portsmouth. The change is made in the hope of securing some local subscriptions.

#### Attleboro & Millbury.

Surveys are being made for a railroad between North Attleboro, Mass., on a branch of the Boston & Providence road, through Wrentham, Franklin, Milford, Upton and Grafton, to Millbury Junction on the Boston & Albany. The line would be about 37 miles long, and would make a new line between Providence and Worcester about 50 miles long, or six miles longer than the Providence & Worcester road.

#### Wilmington, Columbia & Augusta.

Work has been begun on the new repair shops at Florence, S. C., to which point the shops now at Wilmington, N. C., are to be removed.

#### Cheraw & Chester.

The grading on the eastern end is finished from Cheraw, S. C., to Chesterfield Court House, about 20 miles. The contractors are now at work near Lynch's Creek. An effort is being made to secure money for the iron from Chester to Lancaster on the western end of the line.

#### Eastern.

The Massachusetts Legislature having passed the act to legalize the plan adopted for settlement with the creditors, a special meeting of the stockholders has been called, to be held at the Meionon, in Boston, May 16, at 11 a. m. The object of the meeting is to vote upon the question of accepting the provisions of the act, and also, to authorize the directors to execute the mortgage, issue the certificates of indebtedness therein provided for, and to take such other action as may be necessary to carry out the agreement.

#### Massachusetts Central.

The survey for the projected extension westward has been completed. A line has been found from Northampton, Mass., through Westfield, Blandford and Tolland to Great Barrington, which is 41½ miles long with maximum grades of 66 feet per mile going east and 79 feet going west. From Great Barrington to Poughkeepsie the distance is 53 miles. Meanwhile there is no apparent prospect of the resumption of work on the unfinished line from Boston to Northampton.

#### Monadnock.

It is proposed to extend this road from its present terminus at Peterboro, N. H., north by east to Hillsboro Bridge, 18 miles. At the latter place connection will be made with a branch of the Concord & Claremont road. This extension would complete a new and direct line from Concord, N. H., to Springfield, Mass., by the Concord & Claremont, the Monadnock, the Ware River and the Boston & Albany roads. The

extension runs through the Contoocook Valley, and can, it is said, be easily and cheaply constructed; the estimate is \$300,000, or about \$16,700 per mile. The Concord and the Monadnock companies offer to contribute \$75,000 each, provided the Boston & Albany, as lessee of the Ware River road, and the towns along the line will raise the balance. Peterboro has already voted \$20,000. The tendency of much of the business of Southern New Hampshire is towards New York, and the new line would open a very good route for it.

#### St. Joseph & Denver City.

In the suits relating to the collection of taxes on this road in Nebraska, the courts have dissolved all the injunctions against the collectors except some against taxes imposed in certain school districts, which are claimed to be excessive in amount.

#### Emlenton & Edenburg.

Sufficient stock subscriptions have been secured to warrant the company in beginning work, and surveys are now being made. The route is from Emlenton, Pa., on the Allegheny Valley road, northeast up Richey Run to Agnew's Mills and thence by Salem to Edenburg. The distance is about nine miles, and the road is intended to reach the Clarion oil fields.

#### Peach Bottom.

The track on the Western Division is now laid to Delta, Pa., 35 miles east by south from York, and trains are running regularly to that point, which is four miles beyond the late terminus.

#### Covington, Columbus & Black Hills.

The engineers of this company are now engaged in locating the line from Ponca, Neb., to the Niobrara River. The company intends to continue the survey further in the direction of the now famous Black Hills.

#### Chicago, Clinton & Western.

It is reported that work on this road has been resumed at the point to which track was laid last year.

#### Chicago, Braidwood & Southern.

This company was organized at a meeting held in Paxton, Ill., April 28, and purposes constructing a narrow-gauge road from Chicago southward to Paxton—about 105 miles, with a possible extension southward. The Illinois Central already has a very direct line from Chicago to Paxton.

#### Memphis & Little Rock.

In the United States Circuit Court at Little Rock, Ark., the cross-bills filed by some of the stockholders and by H. L. Brinkley as a creditor and stockholder have been thrown out. The Court decided that the first mortgage was not usurious and that the company was legally organized. A decree of foreclosure of the first mortgage was granted and a sale ordered.

#### Chicago & Northwestern.

Parties in Aurora, Ill., are trying to persuade this company to extend its Batavia Branch from Batavia southward to Aurora, about eight miles, the object being to secure a competing line from Aurora to Chicago. The Chicago, Burlington & Quincy now has a branch from Aurora through East Batavia to Galena Junction, and another from Geneva through West Batavia to Aurora, and the proposed extension would be parallel to both, and probably nowhere a mile from either.

#### Virginia & Truckee.

Surveys are being made for a branch from Carson, Nev., southward to Genoa, about 14 miles. This branch would be chiefly used to carry wood and lumber to Carson, Virginia and the mills on the main line of the road.

#### Utah Northern.

The Salt Lake Herald says: "The work of grading on the extension of the Utah Northern in the direction of Montana is progressing rapidly. Fifteen miles of the new grade is ready for the iron. Another section of 10 miles will be completed by June 1, and the management intend to have cars running to Cottonwood, 30 miles beyond Franklin, in September. This will cut down freighting and staging to Montana about 100 miles."

#### California Pacific.

The contractors, Turton & Knox, are pushing rapidly the work on the Tehama Branch, which is to run up the west side of the Sacramento River Valley from Woodland to Tehama. The grading is finished to Colusa, 38 miles north from Woodland, and the rails are laid 16 miles from that place. The rails are all on hand and are delivered as fast as wanted.

#### Southern Pacific.

Work on the great San Fernando tunnel is progressing well; two engines have to be kept constantly at work to keep the headings clear of water. Some 250 Chinamen have been added to the force there and in the Tehachee Pass.

#### Burlington & Missouri River in Nebraska.

In the suit involving the title to about 150,000 acres of land claimed by this company as a part of its grant, the United States Circuit Court has given its decision in favor of the company.

#### Southwest Pennsylvania.

The rails are laid to Mount Braddock, Pa., eight miles southward from Connellsville and three miles beyond the late terminus at Ferguson. Regular trains now run to the latter point. Mount Braddock will be the terminus of the road, for the present at any rate.

#### The Railroad Contest.

The answer of the New York Central to the letter of Messrs. Scott, Jewett and King, published last week, dated at the Grand Central Depot April 28, and signed by Wm. H. Vanderbilt, Vice-President, was as follows:

"Your letter of the 27th, addressed to C. Vanderbilt, President, and Wm. H. Vanderbilt, Vice-President, has been received and duly considered. This company has arrangements with all the competitive roads for west-bound business, which we understand to be satisfactory to all parties interested. So long as good faith is maintained these arrangements will enable us all to receive a fair compensation for transportation, and we are not only willing, but anxious, that they shall continue in force.

"On March 2, 1876, we entered into an agreement with the Baltimore & Ohio, and other roads you represent, in regard to east-bound traffic, and hoped and believed that we had by it satisfactorily settled the differences of the Western roads and equally distributed the business of the country over the great routes to the seaboard. It was in this spirit and to accomplish these results that the agreement was entered into. It is well known, however, that it has not been carried out, and one of the contracting parties did not issue the notices to its agents, requiring them to comply with its provisions, until about a month after it was signed. This company protested through its Vice-President against this injustice and bad faith.

"An almost total loss of business followed, and we were finally compelled to give notice of withdrawal from an agreement which had been faithfully kept by us and constantly violated by others. This action does not necessarily affect any other arrangements which are and have been in force between the parties, and we should greatly deplore any action of the other companies which would bring upon the railroad interests controversies prejudicial to their stockholders. Our withdrawal from the agreement of March 2 simply places the Western roads on east-bound business in the same position we

are on west-bound, and we refuse to exact from them any longer compliance with our dictation. We cannot for a moment admit that this action on our part endangers the railroad interests of the country, and if from a spirit of vindictiveness for what we have done our competitors throw the transportation business of the country into disorder by a general reduction of rates, the responsibility must rest entirely with them. The special case of the Grand Trunk referred to in your communication is only one, and by no means the most important branch of this subject, and if chaos is to follow our declaration to allow a difference on 10 per cent. of the east-bound business, as suggested by your letter, the cause would seem hardly sufficient to justify such a result."

Vice-President King, of the Baltimore & Ohio, was not included in the answer. His name was not signed to the letter received by Mr. Vanderbilt, though it was to the published letter, he having authorized such use of it by telegraph.

#### Cairo & St. Louis.

The operations of the road for March are reported as follows:

Gross earnings (\$140 per mile) .....	\$20,484 94
Working expenses (85.68 per cent.) .....	\$17,552 76
Extraordinary expenses, rentals, etc. ....	4,872 46

Total expenses (109.67 per cent.) .....	22,425 21
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Deficit .....	\$1,940 27
Construction .....	851 00

Total deficit .....	\$2,791 27
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Passenger trains ran 10,735 miles, freight trains, 9,781 and coal trains 5,962, a total of 26,468 train miles. The average receipts per train mile were, for passenger trains, 55.30 cents; for freight trains, 93.57 cents; for coal trains, 91.99 cents. The road worked is 146.5 miles long.

#### Chatham Branch.

The rails are now laid on this road for 6½ miles from the junction with the Intercolonial, leaving 2½ miles yet to be laid to reach Chatham. Tenders for the ballasting, coal-sheds and water tank have been advertised for, and the road will be opened probably in June. It extends from a junction with the Intercolonial northeast to the town of Chatham, at the mouth of the Miramichi.

#### The Detroit River Crossing.

It is now proposed to make a railroad crossing of the Detroit River at Belle Isle, just above the city of Detroit. The plan is to carry the railroad over the American channel by a bridge, run across the island and under the Canadian channel, which is the principal one, by a tunnel. It is said that the tunnel there can be constructed at a reasonable cost and without much difficulty.

### RAILROAD LAW.

#### Consequential Damages for Negligence.

An English decision on this point may be of interest as showing how the law there is interpreted. Such a case was recently decided by the Court of Appeal in *Sneeby* against the Lancashire & Yorkshire Company, on appeal from the Queen's Bench. In this case cattle of the plaintiffs were driven along a road across which were some sidings belonging to the defendants, when some trucks of defendants were negligently allowed to run down it across the road, separating the cattle from the drovers, and frightening them so that some of them ran down the road, broke through an imperfect fence into an orchard, whence they strayed upon defendants' railroads and were killed by a passing train. *Held*, that the defendants were liable, and that the damage was not too remote; and that the imperfect construction of the orchard fence was no defence to the action.

#### Crossing the Track to Take a Train.

In *Kline* against Jewett, Receiver of the Erie Railway, which was an action to recover damages for injury received while crossing one track to enter a train standing on another track, the New Jersey Court of Errors and Appeals has affirmed the decision of the Supreme Court. It was insisted for the defendant that the principle that a person about to cross a track on a highway is bound to look up and down, applies in this case, where the party injured was compelled to cross the track to enter the cars of the defendant. *Held*, that the principle does not apply. The plaintiff was not only warranted in believing that there was no train approaching when the regulations of the company required him to cross the track to take a train, but if even, under such circumstances, he had seen a train approaching, he would have been warranted in believing that it would stop before reaching the place where he was required to cross. Driving a train of cars along a track which passengers are required to cross, and at the time they are required to cross, is gross negligence. The plaintiffs cannot be held guilty of contributory negligence.

#### Construction and Maintenance of Road Crossings.

In *Hurley* against the Jeffersonville, Madison & Indianapolis Company, the Indiana Superior Court holds: 1. A railroad corporation is not only required to construct its tracks at a public crossing so that they may be reasonably safe to persons driving across the same, but to maintain them in a reasonably safe condition. 2. In such construction, as well as maintaining them in safe condition, they are bound only to ordinary care and skill, the right and duties of corporation and individual being mutual.

#### Walking on the Track.

In *Scudder* against the Indianapolis & St. Louis Company the Indiana Superior Court decided: 1. A railroad track is of itself a notice or warning of danger to any foot passenger crossing or walking thereon. 2. A person who assumes to walk on a railroad is bound to use more care than in walking along an ordinary foot-way. 3. On approaching a person walking by the side of the track, the engineer has a right to presume that the person so walking will not put himself into danger. 4. The engineer must give all due cautionary signals, exercise reasonable care, and not steal upon the pedestrian. 5. The running of a train in a town at a rate of speed contrary to ordinance is not of itself evidence of more than negligence, and is not conclusive even then.

#### Taxation of Capital Stock.

In *Kimball* against Milford the New Hampshire Supreme Court decided as follows: If a railroad corporation, situated in another State, pays a specific tax upon all its capital invested or expended, whether represented by capital stock, or indebtedness of a corporation, and such taxation is declared to be in lieu of all State, county, township, or other taxes in that State, and it appears that such specific tax was intended to be a fair equivalent for the taxes that would otherwise be laid on such property by the ordinary means of taxation, such property should not again be taxed in this State, to the owners of shares of the capital stock of such corporation.

#### The New Maryland Railroad Tax Law.

The law passed by the late Legislature of Maryland providing for the taxation of railroad property is as follows:

Section 1. Be it enacted by the General Assembly of Maryland, That the property, real and personal, of each and every railroad company in this State working their roads by steam shall be assessed and taxed for county and municipal purposes in the same manner as the property of individuals is now assessed and taxed, and the authorities of the several counties and the city of Baltimore are hereby authorized and directed



